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DECEMBER 1974

Environmental Protection Agency

March 1975

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General introductory information on the Federal Industrial Pollution Control Program is also presented to provide perspective on the magnitude of industrial pollution and the research directions that must be pursued in order to develop the technology to adequately control this largest point source of pollution in the United States.

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PROJECTS IN THE
INDUSTRIAL POLLUTION CONTROL DIVISION
DECEMBER 1974

PEMP 1BB036 Task 003
1BB037 Task 003

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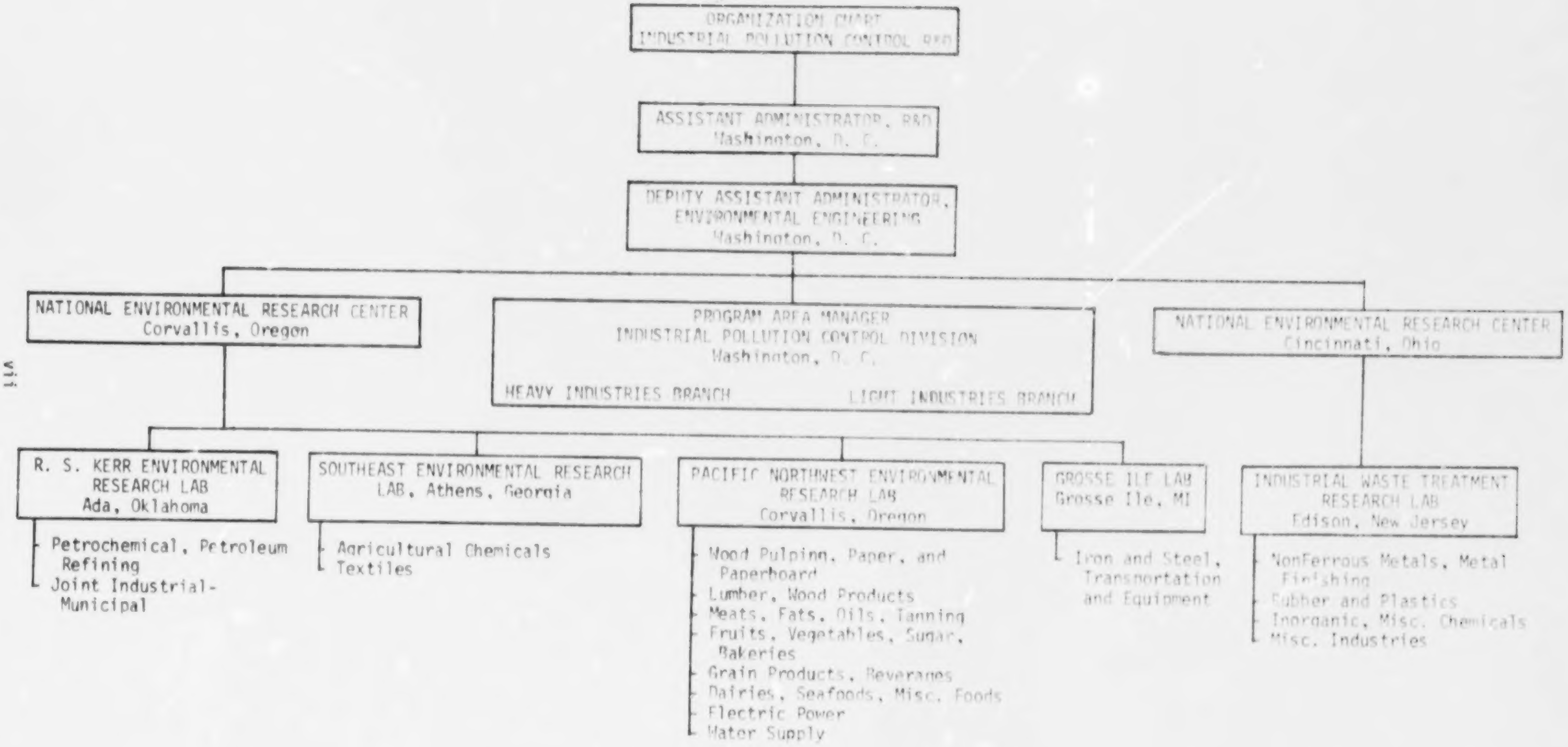
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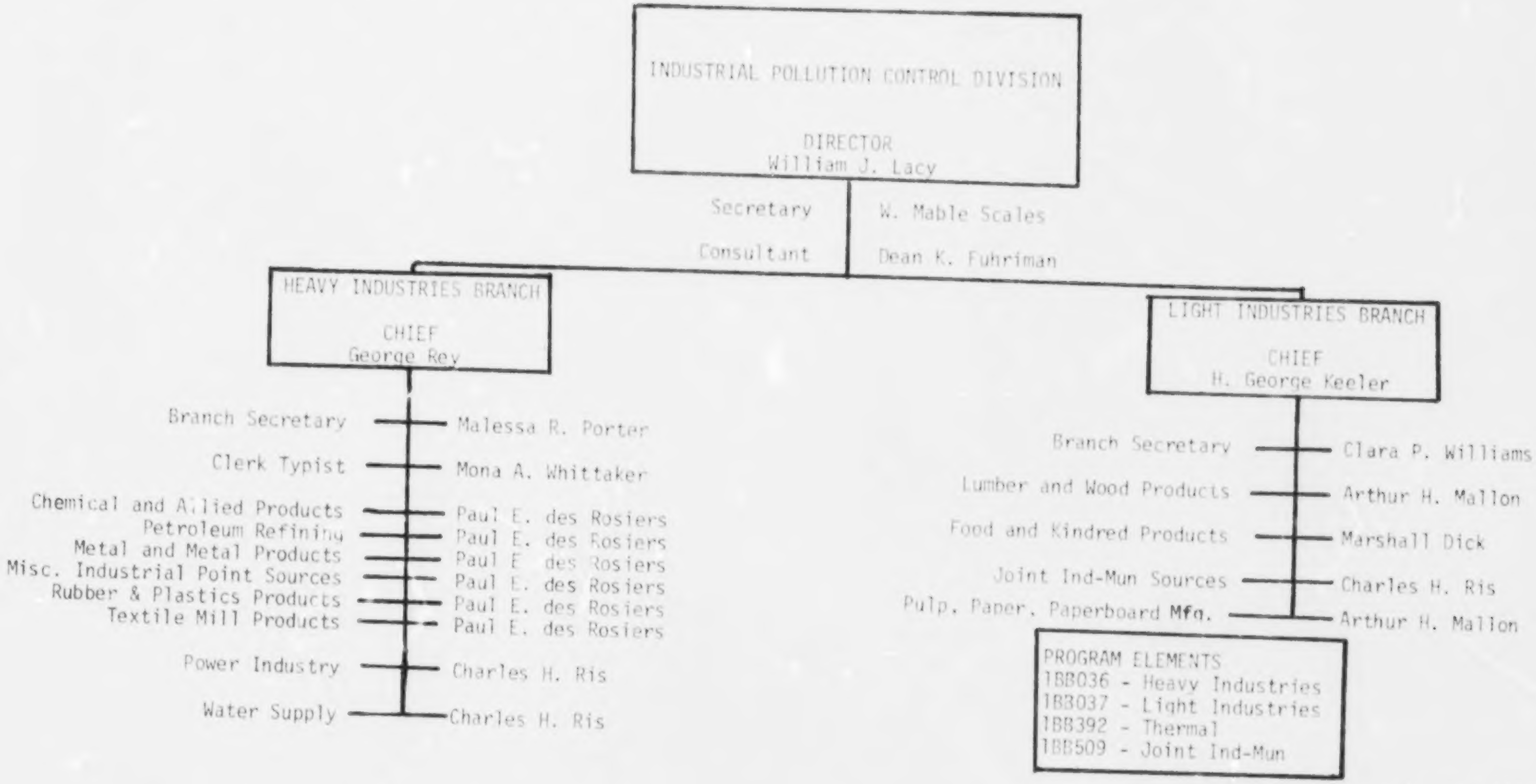
Rubber and Plastics
Inorganic, Misc. Chemicals
Misc. Industries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1BB037 - Light Industries
1BB392 - Thermal
1BB509 - Joint Ind-Mun

January 1975

INTRODUCTION

WATER QUALITY LEGISLATION DEALING WITH INDUSTRIAL SOURCES

History

The first legislation relating to water quality was the Rivers and Harbors Act of 1899, followed by the 1909 Boundary Waters Treaty between Canada and the United States. Both were oriented toward the navigational aspects of rivers for commercial purposes. The Public Health Service Agency was established by legislation in 1912. PL 68-238 (Oil Pollution Act of 1924) provided for protection of navigation from "obstruction and injury by preventing the discharge of oil into the coastal navigable waters of the United States."

The first step toward restoration of our national water resources was taken in 1948, with enactment of PL 80-845 (Federal Water Pollution Control Act) to "provide for water pollution control activities in the Public Health Service." This act established the Federal Water Pollution Control Advisory Board. In addition, the topic of industrial waste treatment research was covered: the act provided support and technical aid research to the states "to devise and perfect methods of treatment of industrial wastes which are not susceptible to known effective methods of treatment." This act had several amendments: PL 82-579 (Water Pollution Control Act Extension of 1952), PL 84-660 (Water Pollution Control Act Amendments of 1956), and PL 87-88 (Federal Water Pollution Control Act of 1960).

Another law amending the 1948 Act was PL 89-234 (Water Quality Act of 1965), which established the Federal Water Pollution Control Administration (FWPCA) to "provide grants for research and development, to increase grants for construction of sewage treatment works, to require establishment of water quality criteria and for other purposes." This was the first water legislation authorizing a federal technology research program for the restoration of the nation's water resources.

PL 84-753 (Clean Water Restoration Act) amended the Federal Water Pollution Control Act again in 1966 in order "to improve and make more effective certain programs pursuant to such acts." Section 6(b) of this act provided authorization for "grants to persons for research and demonstration projects for prevention of pollution of waters by industry including, but not limited to, treatment of industrial waste." Also, Section 6(a)(2) provided for authorization for grants for assisting in the development of any project that would demonstrate new or improved methods of joint treatment systems for municipal and industrial wastes.

The 1966 Act made the first significant provision for water pollution technology research activities. The intent of making private institutions eligible for participation in these activities was to combine the private and public resources of the nation to work on the water pollution problem. The provision for the use of Federal funds for grants to private institutions in joint pollution control research ventures could be considered as the carrot in a "carrot-and-stick" approach. The "carrot" would be the incentive to advance technology in a manner conducive to cleaning up the environment; so doing, a basis for establishing or improving environmental regulations ("the stick") would evolve as an output.

PL 91-190 (National Environmental Policy Act of 1969) established the Council of Environmental Quality and also established environmental pollution and restoration as a national policy. This law requires Federal agencies to prepare, and circulate for comment, analyses of the environmental impacts of their actions. Agencies must disclose the impact of proposals, consider reasonable alternatives, and integrate the goals and objectives of the act into traditional missions and patterns of decision making.

The District of Columbia Court of Appeals issued a significant decision concerning Federal technology programs and the assessment of the implications of related research activities when they have reached a stage of commitment to implementation likely to restrict later alternatives. The relationship of this decision and the need for assessing the EPA R&D program proposed in this achievement plan is relevant. Any major effort by the Agency to expand the program along the course proposed by this plan should be construed as a commitment toward the implementation of the developed results of the proposed program.

Current: PL 92-500

PL 92-500 (Federal Water Pollution Control Act Amendments of 1972) is based on technology. It brought together the disciplines of administration, engineering, economics, law, and the ecological sciences in order to define the national program in water pollution control.

PL 92-500 clearly specifies the objective, policies, and goals of the national water pollution control program, all of which are relevant to industrial pollution point sources. The national program directives are pictorially presented in Figure 1.

In establishing the objective "to restore and maintain the integrity of the nation's waters," Congress provided a focal point for planning all EPA water pollution programs. In order to meet the objective, PL 92-500 specified Agency activities necessary to achieve the goal of "elimination of the discharge of pollutants into navigable waters" by industrial point sources. These activities are:

1. EPA will establish industrial effluent limitations and standards.
2. EPA will establish toxic pollutant and industrial pretreatment standards.

3. EPA will institute a nationwide permit and licensing program for industrial discharges.

4. EPA will mount a major research and demonstration effort to develop the technology necessary to eliminate the discharge of pollutants into navigable waters, waters of the contiguous zone, and the oceans. To accomplish this, the law mandates that EPA shall conduct and promote the coordination and acceleration of research, investigations, experiments and demonstrations, surveys, and studies relating to the extent, prevention, reduction, and elimination of pollution.

   As a result, EPA is authorized to:

   a. Conduct continuing comprehensive studies of the effects and methods of control of thermal discharges

   b. Contract with public or private groups and individuals

   c. Develop effective and practical processes, methods, and prototype devices

   d. Conduct research and investigations on technology for reducing the flow of sewage and water consumption

   e. Conduct projects with public agencies to assist them in the development of advanced waste treatment and water purification methods and to develop new and/or improved methods of treating combined municipal-industrial wastes

   f. Conduct projects with any state or related agency that will demonstrate, in river basins or portions thereof, advanced treatment and environmental enhancement techniques to control pollution from all sources

   g. Conduct specific grant and contract R&D projects for the prevention of pollution and the reduction and elimination of the discharge of industrial pollutants

      (1) With priority attention to waste management methods for the elimination of the discharge of pollutants including the effects of pollutants from in-place or accumulated sources

      (2) With priority attention to advanced waste treatment methods for reclaiming and recycling water and confining pollutants so that they will not migrate to cause water or environmental pollution (indirect pollution control).

CURRENT EPA R&D PROGRAM FOR INDUSTRIAL POINT SOURCE CONTROL

The FWPCA set up an R&D program to meet the objectives of PL 84-753 (Clean Water Restoration Act of 1966). This program was to demonstrate for each significant industry (essentially the "wet" industries) the technology for eliminating water pollution from the sources. This technology was to include new and/or improved methods having industry-wide application. This technology thereby became a basis for future regulations.

Three milestones were established within the R&D program. These were to develop and demonstrate the technology necessary to achieve the equivalency of secondary treatment (=85% BOD removal), to achieve state water quality standards (=95% BOD removal), and to eliminate all water pollution caused by industry. The first two milestones of technology were considered as stepping stones toward complete control by the principle of containment (closed cycle) or treatment before discharge (open cycle), with emphasis on the former. Achievement of these milestones would provide an upgraded state-of-the-art for industrial wastewater treatment that would eliminate Federal R&D involvement in favor of industry's own continued R&D maintenance program at an appropriate time in the future.

The initial weakness of this R&D approach was the absence of an official time frame for achieving any specific level of practicable technological levels. This weakness was remedied by the passage of PL 92-500, which called for the establishment of effluent standards that were to be administered through the National Pollution Discharge Elimination System (NPDES). This law maintained the need for advancing technology toward a goal of achieving the elimination of the discharge of pollutants. There were shortcomings with regard to having industry limit itself to the widespread usage of developed and demonstrated technology by voluntary implementation, although voluntary implementation was in fact being undertaken in some instances. The Act required implementation to be in compliance with permit conditions, based on specific levels of technology-based pollution control, by certain dates. There are three levels of pollution control specified, and they are comparable to levels sought in the original milestones established for the technology R&D program.

In order to implement, operate, and develop the R&D program effectively, it was determined to establish pre- and post-program state-of-the-art; to establish centers of excellence: to develop the cooperation of industry in order to achieve and then maintain the terminal state-of-the-art; and to develop technology-based guidelines and standards for each significant industrial waste. (The responsibility for this latter function was given to the Air and Water Programs by the EPA Administrator in 1971.) The above steps were planned, but not required, to be achieved within a specific time frame, assuming that a certain level of Federal funding would be available.

The program has operated by receiving state-of-the-art knowledge from applicants (along with their capabilities) and from all other sources readily available through selected contracted studies and R&D grants. The program initiated and incorporated the concepts of by-product recovery, process change, and water recycle as a necessary part of a sound national program. General guides for evaluating new technologies on a comparable economic basis were developed. These included achieving effective treatment and/or control of wastewaters within the economic constraint of cost of implementation not to exceed 2% to 4% of manufacturing cost. It should be noted that the viability of a technology is determined by its economic acceptability or adsorbability (in the case of forcing acceptance). Costs identified in excess of the range specified have been used to identify the need to consider manufacturing process changes or raw materials alterations in lieu of end-of-pipe treatment as the more likely payoff areas for R&D investment. Demonstration of by-product recovery, process change, and wastewater reuse approaches to pollution control were sought. Many opportunities to pursue these approaches were found and brought forth by the private sector. These approaches are examples of cost/benefit effective solutions to control pollution in lieu of end-of-pipe treatment technology.

An operating policy for the administration of R&D grants also evolved. This was the result of the Federal need to deal with private industry on a joint-venture research basis. The joint-venture approach (through cost-sharing grants) was found to be more economical in terms of taxpayer dollars than the contract approach (in which the entire financial burden is absorbed by the Federal Government). The program made ample use of headquarters, regional, and laboratory personnel for relevancy, policy, and technical evaluations. Capital obligations of a Federal grant share of a project cost were avoided. In addition, cost overruns were not considered for supplemental Federal funding, any cost overruns were incurred by the grantee. The program was characterized as being essentially extramural, letting those who have the problem solve it with their skills and resources, under general Federal guidance and direction and partial financial assistance. Industrial cooperation and financial contribution have been substantial. Unfortunately, limited resources have not allowed extensive involvement with all the significant industrial segments of concern to the NPDES program established under PL 92-500.

Mechanisms have been established to ensure EPA-industry cooperation to resolve a national problem. Technology produced has become publicly available. Financial participation has also been assured; to date, over two industry dollars have been expended for every EPA dollar. The productivity of the joint approach of R&D has been acknowledged by the participating parties; EPA coordinates the national program for industry, a task that industry should not and would not take on because of antitrust laws and the competitiveness of private enterprise.

The program has proved to be an effective and high-leverage (Federal to private resources) method of advancing the state-of-the-art. It has enabled EPA to develop expertise in various industrial sectors within the constraints of the limited resources used over the past six years.

The demonstration projects involved have propagated research activities in industry and other agencies and have developed communication with related national industrial organizations. Technology transfer between industrial competitors was made possible without violation of antitrust laws. Manufacturing processes have been improved, resulting in better products, at less cost, and greater reduction of pollution loads, all to the betterment of the industry and the nation.

Industrial associations have participated in the EPA program and have indicated the value of working together to reduce the financial impact of duplicative R&D expense on the individual industrial memberships. Laboratory and small-scale feasibility investigations of new technologies have been carried out by individual industrial grant applications, who have sought support in further establishing the newer technologies. Where an industrial group as a whole was found reluctant to work cooperatively in the R&D grant program, individual companies representative of that industry have been willing to participate in the program.

In addition to direct involvement of the private industrial sector, public institutions have also been involved extensively in projects involving industrial technologies as well as projects for joint industrial-municipal pollution control in Publicly Owned Treatment Works (POTW). Eight state agencies are directing and coordinating technology research in conjunction with industries within their borders as a result of EPA grants relevant to the EPA mission. POTW, PTA (Public Treatment Authority), and PO (Publicly Owned) utilities are currently involved in projects to achieve the advancement of technology necessary to clean up the nation's waters. Several problem areas have been identified in which the only plausible solution to cleanup was through a combined and cooperative effort of the public and private sectors of the nation.

THE NEED FOR A VIABLE FEDERAL R&D EFFORT

Industrial wastes are the largest man-made or man-induced point sources of pollution entering the environment. The sources are grouped into four major classes of origin for the purpose of this plan: heavy industries, light industries, electric power generation utilities, and combined industrial and municipal sewerage systems (Publicly Owned Treatment Works (POTW)) wherein the industrial portion of the waste load is the overriding consideration. In many instances the industrial portion discharges incompatible industrial pollutants that pass through, are not susceptible to treatment in, or interfere with the operation of POTW. Such pollutants require pretreatment or treatment on site or in specialized basin or areawide service facilities.

According to the U. S. Water Resources Council, industry accounted for almost 50% of all water used in the United States in 1965. It is estimated that by 1980 more than 60% of all water used will be drawn by industry.

The annual volume of wastewater discharges originating from all (municipal and industrial) point sources (exclusive of power utilities) is estimated to be in excess of 20 trillion gallons/year. (Power utilities use an additional 37 trillion gallons/year). About 70% of this, or almost 14 trillion gallons, is contributed by industry. Approximately 10 trillion gallons of industrial wastewater are cooling waters (both contact and non-contact) and other non-process waters: the remaining 4 trillion gallons represent industrial process wastewater.

The amount of BOD_5 (Biological Oxygen Demand) and SS (Suspended Solids) in industrial process raw wastewaters is equivalent to that of untreated domestic sewage from a sewered population of more than 400 addition to the high BOD_5 and SS, industrial process wastewater contains varying concentrations of different pollutants such as dissolved solids toxic and hazardous constituents, color, nutrients, and ingredients that are incompatible with POTW. Industrial operations and pollution control activities also produce significant amounts of residues (potential or actual solid wastes) which, because of their water solubility, may enter our nation's waters directly or indirectly.

Industrial wastewaters emanate from more than 400 different manufacturing subcategories, each with different waste characteristics. Over 300,000 individual establishments are classified within these subcategories, and more than 20,000 of these establishments are major industrial facilities. Many of these point sources are significant water pollution sources. The problem is further amplified by the fact that industrial expansion is taking place at an annual rate of nearly 4%, about triple the population growth rate.

The rapid rate of expansion, the complexity of point sources, and the diverse characteristics of industrial wastes result in the discharge of many new synthetic chemicals. Many of these new chemicals are to inhibit biological activities; some are toxic or hazardous, while toxicity of others has yet to be determined. Many of these chemicals are entering the environment without any significant monitoring or regulatory control.

The economic aspects of industrial pollution control are an integral part of assessing the viability of a technology base used for the purpose of establishing effluent water quality standards for point source discharges. The economic impact resulting from the application of new technology and the practicability of the technology to satisfy PL 92-500 requirements must be guided by cost/benefit analysis before establishment of regulations requiring nationwide implementation. Another factor that should be considered before making the final assessment is the reasonableness of the potential cost as it relates to the typical cost of manufacturing within the industrial segment. Guidelines and/or criteria as to what constitutes reasonableness, based on the characteristics of the industrial segment, are necessary in order to judge the adequacy of the technology developed as a potential solution to industrial pollution problems.

For the past several years the Office of Environmental Engineering of EPA has used a rule of thumb that a net cost range of 2% to 4% of manufacturing costs of "wet industries" is a proper environmental requirement to expect for practicable water pollution control for these industries, based on end-of-pipe treatment. (The "wet industries" are those heavy water users that have significant impact on water pollution.) Costs in excess of this, when applying an applicable end-of-pipe treatment technology, have been viewed as indicators of the need to upgrade manufacturing technology (process change) and/or in-plant practices, alter raw materials used, or optimize overall industrial water management practices. With an appropriate technology research effort during the next decade it is believed that all significant discharges causing pollution can be eliminated within a cost range of 2% to 4% of manufacturing cost.

Economic impact studies indicate that costs of this range of magnitude will not materially affect the health of the U. S. economy. Experience in England indicates that the "capital cost of an effluent-treatment plant for a chemical factory is normally between 3% to 5% of the capital cost of the factory and the viscose industry is no exception." The chemical industry is one of the most significant of "wet industries." For "dry" industries the costs of water pollution control should be less, even when water effluent discharges are characteristic of the industry. For some "dry" industries there is essentially "no discharge" of water effluents.

The magnitude of industrial discharges, their diversity of pollutants, the numerous classifications of industrial activity, and the potential economic impact of a national effort to contorl and abate these sources of pollution suggested an obvious need for a coordinating Federal role for any significant R&D effort directed to support advancing technology toward the objective of PL 92-500. The Act's reliance on regulatory standards for discharges is dictated by the technological state-of-the-art. This state-of-the-art can only be changed by an investment in R&D.

CHEMICALS AND ALLIED PRODUCTS, AND PETROLEUM REFINING

The basic objective of the industrial wastewater treatment research program with respect to the chemicals and allied products and petroleum refining industries is to establish the technology for new or improved pollution control methods, having industry-wide application, which will support the mandates of the Federal Water Pollution Control Act of 1972, PL 92-500. The significant wastewater sources in the chemicals and applied products and petroleum refining fields are shown in the following table, which is organized according to the Standard Industrial Classification (SIC) System and which is based on data taken from the 1967 Census of Manufacturers - Water Use in Manufacturing, a U. S. Department of Commerce publication. (Further subcategorization is delineated in a subsequent paragraph.)

SIC	Industry Description	1968 Wastewater Discharge Million Gallons
281	Industrial Inorganic Chemicals	832
283	Drugs	67
284	Soaps, Detergents, and Cleaning Preparations, etc.	30
285	Paints, Varnishes, Lacquers, Enamels, and Allied Products	6
286	Industrial Organic Chemicals	2,181
287	Agricultural Chemicals	114
289	Miscellaneous Chemical Products	190
29	Petroleum Refining and Related Industries	1,217
	TOTAL	4,637

The chemicals and allied products industry produces large numbers of different products and mixtures thereof. Identical products are, in many instances, made by any one of several different manufacturing processes. Also, the manufacture of certain basic chemicals by non-chemically classified standard industries further compounds the problem of a clear definition of the sub-industrial classification within the industry. These dimensions of complexity do not make it readily feasible to characterize all the manufacturing establishments solely by the specific products produced or solely by the manufacturing process in use. Accordingly, the sub-industries may either be classified on the basis of a pollution problem based on the pollution problem of the major controlling pollutant in the effluent, on the general type of manufacturing operation, or by the class(es) of product(s) produced.

The difficulty of defining the sub-industries by the SIC code numbers has led to acceptance of an arbitrary division of the industry into primarily two major sections: organic chemicals and inorganic chemicals. In this method of classification, a sub-industry, as defined by the SIC code, may be considered as in either the organic or inorganic product classification depending on the specifics of the plant in question. Hence, a complete sub-categorization, including the petroleum refining category, follows:

SIC	Industry Description
28	Chemicals and Allied Products
281	Industrial Inorganic Chemicals
	2812 Alkalies and Chlorine
	2813 Industrial Gases
	2816 Inorganic Pigments
	2819 Industrial Inorganic Chemicals, n.e.c.
283	Drugs
	2831 Biological Products
	2833 Medicinal Chemicals and Botanical Products
	2834 Pharmaceutical Preparations
284	Soaps, Detergents, and Cleaning Preparations, etc.
	2841 Soap and Other Detergents, Except Specialty Cleaners
	2842 Specialty Cleaning, Polishing, and Sanitation Preparations
	2843 Surface Active Agents, Finishing Agents, Sulfonated Oils, etc.
	2844 Perfumes, Cosmetics, and Other Toilet Preparations
285	Paints, Varnishes, Lacquers, Enamels, and Allied Products
286	Industrial Organic Chemicals
	2861 Gum and Wood Products
	2865 Cyclic Crudes and Cyclic Intermediates, Dyes, and Organic Pigments
	2869 Industrial Organic Chemicals, n.e.c.
287	Agricultural Chemicals
	2873 Nitrogenous Fertilizers
	2874 Phosphatic Fertilizers
	2875 Fertilizers, Mixing Only
	2879 Pesticides and Agricultural Chemicals, n.e.c.
289	Miscellaneous Chemical Products
	2891 Adhesives and Sealants
	2892 Explosives
	2893 Printing Ink
	2895 Carbon Black
	2899 Chemicals and Chemical Preparations, n.e.c.

SIC	Industry Description
29	Petroleum Refining and Related Industries
	2911 Petroleum Refining
	2951 Paving Mixtures and Blocks
	2952 Asphalt Felts and Coatings
	2992 Lubricating Oils and Greases
	2999 Products of Petroleum and Coal, n.e.c.

The Organic Chemicals Industry

The important products of this industry are miscellaneous cyclic and acyclic organic chemicals and chemical products, flavor and perfume materials, gum and wood chemicals, drugs, organic fertilizers, soaps and detergents, pesticides, miscellaneous chemical products and other synthetic organic chemicals. The industry ordinarily includes production of monomers, but does not include production of polymers or plastics and synthetic fibers. Of total shipments in 1967, 75 percent were miscellaneous acyclic chemicals, a large number of which are generally designated as petrochemicals. The expansion of the petroleum industry into chemical production is of particular significance.

Organic chemicals industry pollutants originate from the incomplete removal of principal products or raw materials from reactions, in the production of non-recoverable or useless by-products, from equipment cleaning operations, and from such water uses as cooling and steam production. Wastewater generation in the industry per unit of product varies so widely that an average value has little meaning except in a statistical sense; wastewater generation varies from less than 100 gallons per ton of product to more than 100,000 gallons per ton of product. The principal contaminants in the industry's wastewaters are BOD, COD, oil, suspended solids, acidity, alkalinity, heavy metals, color, taste and odor-producing compounds, and residual organic products and by-products.

The production of organic chemicals results in many types of contaminated wastewaters, and the treatment methods employed cover the range of known practical techniques. In-plant control is the first step in instituting treatment practices. Such controls include the salvage of unreacted chemicals, recovery of by-products, multiple reuse of water, good housekeeping techniques to reduce leaks and spills, and changes in processing methods. These controls can result in reducing the concentrations of almost all potential pollutants and can, most importantly, reduce the volumes of wastewaters requiring treatment. Physical treatment methods such as sedimentation or flotation are used primarily to remove coarse suspended matter and floating oils and scums. Filtration is used as a form of tertiary treatment for reuse or as a pretreatment step. Chemical treatment is used primarily as a pretreatment prior to sedimentation, filtration, or biological treatment. Biological treatment, that is, anaerobic and/or aerobic BIOX, is most widely used in the industry due to the nature of the wastes, that is, their general susceptibility to biodegradation as evidenced by relatively high BOD/COD values.

Wastewaters from organic chemical processes consist of contaminated and relatively clean effluent streams. In general, the contaminated wastewaters are those which are used in direct contact with products or by-products in reactions, separation processes, vessel cleanouts, etc. The cleaner wastewaters are those used for indirect heat exchange, general washing, etc.

The sources of contaminated wastewaters from petrochemical operations are three-fold. First, wastes containing a principal raw material or product arise during the stripping of the product from a solution. Incomplete removal is a fundamental requirement of any equilibrium process. However, use of more expensive or additional separation equipment may result in reduction of effluents. By-products produced during reactions constitute a second source of wastewaters. Many petrochemical reactions take place under extreme conditions where the vagaries of organic chemistry result in the production of chemicals other than those specifically desired. Often markets cannot be found for those chemicals or they cannot be reasonably recovered and are discarded to the waste stream. New production methods are directed toward increases in yields and reductions in by-products; accordingly, new technology often results in a decrease in this source of waste. Spills, slab washdowns, and vessel cleanouts comprise a third category of effluents and these are generally not controllable by means of process modifications. Changes in catalyst concentrations and increases in yields, however, reduce the amount of pollutants from this source and result in some changes in the character of the waste.

Joint industrial-municipal treatment has proved to be very effective in treating organic chemical wastewaters, particularly for smaller chemical plants located near large municipal treatment systems. Treatment costs play an important role in governing the expansion of joint treatment participation. Rates established by municipalities vary extremely. There are also some instances where a specific plant has accepted a municipal waste into its treatment facility, oftentimes as a source of badly needed nutrients for a BIOX system.

The industry has generally found that in-plant, separate treatment has economic advantages, particularly when significant quantities of contaminated wastewater are involved. No significant percentage increase is expected in the amount of organic chemical wastewaters that will be treated in joint systems in the near future. On the basis of an annual production of about 117.2 billion pounds by the organic chemicals industry in 1968, municipal discharges might be expected to be about 830 gallons per ton of production for the industry as a whole.

The Inorganic Chemicals Industry

The inorganic chemicals industry is also not easily definable in terms of the SIC numbers. The most important of the groups in terms of product value may be noted as alkalies and chlorine, fertilizers (excluding ammonia and urea), and inorganic chemicals, n.e.c. However, it is not sufficient to ignore such groups as industrial gases (excluding organic gases), which include the important production of nitrogen and oxygen, paints and allied products, the latter of which includes the vital surface coatings industry, or inorganic pigments, which involves inorganic pigments such as titanium oxide. The surface coatings industry is typical of the relationship which exists between segments of the inorganic chemicals industry and the organic chemicals industry. The solvents and film formers, which are utilized within the inorganic chemicals industry for the production of surface coatings, are important products of the organic chemicals industry, whereas inorganic pigments, primarily oxides and salts of titanium, iron and other metals, are products which fall into the inorganic chemicals industry category. The total product is generally defined as being part of the inorganic industry. However, it is obvious that the complex relationships which exist between various products and industries (necessary to the smooth functioning of our technological state) make it extremely difficult, if not impossible, to arbitrarily associate certain products with one SIC category.

The overall output of industrial inorganic chemicals, since they are utilized in a wide range of industries and for a wide variety of purposes, usually well removed from the final consumer, depends upon the level of total economic activity rather than the economic activity in any specific segment of the economy.

Changes in consumer preferences or redistribution of income and spending, such as changes in tax levels or defense spending, may affect product mixes, but do not significantly affect total industry output. In general, price competition and product substitution are not as significant in the inorganic chemicals industry as in the organic chemicals sector. However, changes, although slow to come, tend to be quite profound.

Supplies of raw materials frequently vary and, in the case of certain materials, the industry may face serious shortages until new raw material sources (usually ores or brines) are developed. The widely fluctuating price of sulfur over the past ten years is a classic case resulting from supply fluctuations which can be matched by mercury, potash and silver, among others. Since new sources of minerals are found infrequently and usually involve relatively large expenditures to develop, wide fluctuations in the gap between demand and readily available supply are quite common in the inorganic chemicals industry.

Industrial chemical industries are generally capital intensive operations (with a few exceptions such as the paint manufacturing industry) and are characterized by high productivity, high wages, a low labor turnover, and a continuing demand for skilled labor. Most of the plants operate continuously and must operate at 75 to 85 percent of capacity to maintain adequate levels of efficiency and profitability. Smaller plants generally operate batch processes, and hence, tend to produce low-volume, high-cost, specialized chemicals.

Regional growth rates reflect a continuing trend to move production facilities closer to raw materials and markets. The industry, as a whole, is thus tending to concentrate in the Midwest and Southwest.

Wastewater from inorganic chemical processing consists both of contaminated and relatively clean effluent streams. In general, the contaminated wastewaters are those taken from processes, whereas the cleaner wastewaters are those used for indirect heat exchange, general washing, etc. Clean waters are basically uncontaminated and can be discharged untreated. Cooling water and steam condensates are the primary sources of such water.

Contaminated wastewater from the inorganic chemicals industry arises primarily from electrolysis and crystallization brines, washings from filter cakes, spent acids and alkalies, and washings from raw materials. These wastewaters are generally characterized by both dissolved solids and suspended solids. In addition to contaminated waste streams, process cooling discharges occur, accounting for 40 to 80 per cent of the total discharge on the average. Treatment practices vary, but involve in-plant segregation of contaminated wastes from uncontaminated cooling waters.

Many waste treatment methods are available depending on the degree of treatment required; however, equalization, neutralization, sedimentation and lagooning processes are most widely used. Biological treatment is not applicable, since the contaminants are primarily dissolved or suspended inorganic materials. Plants with small discharges tend to employ only equalization and neutralization with total discharge to municipal sewer systems for joint treatment. It is estimated that between 10 and 20 percent of the process wastewater discharged from this industry is to municipal systems (7.9 percent of the total discharge). No significant percentage changes in this regard are expected through 1974. The inorganic chemicals industry has generally found that in-plant, separate treatment has economic advantages, particularly when significant quantities of wastewater are involved.

The Petroleum Refining and Related Industries

The petroleum refining industry is by far the largest water user in this subprogram element. The industry uses 20 billion gallons of water per day or 20 percent of total industrial water usage. Approximately 0.25 billion gallons per day are used in processing operations. Many distinct operations such as crude oil distillation, reforming, catalytic cracking, thermal cracking, polymerization, alkylation, gasoline and middle distillate treating, motor oil manufacturing, etc. are utilized. Foul condensate is usually pretreated at the source, but, for the most part, refiners depend on central waste treatment facilities for pollution control. Oil separation and recovery, followed by biological conversion of phenols, sulfides, etc., are the treatment techniques most frequently employed. Greater emphasis on more effective treatment, waste treatment at the source, product recovery, water reuse, and development of treatment methods requiring less land areas are needed.

PROJECT INDEX

CHEMICALS AND ALLIED PRODUCTS, AND PETROLEUM REFINING

	Grantee or Contractor	Project Status
DIS	Union Carbide Corporation	A
DIT	Texas A&M Research Foundation	C
DKF	University of Oklahoma Research Institute	A
DML	American Oil Company	B
DMT	Engineering Science, Incorporated	A
DQC	State of Louisiana	A
DRC	Illinois Institute of Technology	A
DSH	American Petroleum Institute	A
DXR	Harvard University	C
EAS	The Dow Chemical Company	A
EAW	E. I. duPont de Nemours and Company	B
EEQ	The Dow Chemical Company	A
EFW	Armour Industrial Chemical Company	B
EGC	State of Alabama	B
EGM	Farmers Chemical Association, Incorporated	B
EID	Engineering Science, Incorporated	A
EJI	Datagraphics, Incorporated	A
EKT	American Oil Company	A
EMI	State of Louisiana	B
EPH	Celanese Corporation of America	B
ERM	Mineral Pigments Corporation	A
EXG	Manufacturing Chemists Association, Inc.	A

	Grantee or Contractor	Project Status
EZG	Shell Oil Company	A
FER	Union Carbide Corporation	A
FOH	CIBA-GEIGY Corporation	B
FPD	Battelle-Northwest	A
FYE	University of Texas	A
GIZ	Southern Dyestuff Company	B
GND	Datagraphics, Incorporated	A
GTR	Atlantic Richfield Company	B
GXF	B. P. Oil Corporation	B
14-12-435	C. W. Rice and Company	A
5-532-1	Water Economy Research Institute, Poland	B
68-01-0083	Envirogenics Systems	B
68-01-0457	Diamond Shamrock Corporation	A
68-03-0456	Repro Chemical Corporation	B
68-03-2133	Hoechst-Uhde Corporation	B
800300	The Dow Chemical Company	B
800312	Georgia Institute of Technology	B
800554	University of Missouri - Columbia	B
800602	Southern Research Institute	A
800766	The Dow Chemical Company	B
800773	State of Louisiana	B
800857	Illinois Institute of Technology	B
800947	Texas A&M University	B
801030	University of California - Berkeley	B

	Grantee or Contractor	Project Status
801159	Pharmaceutical Manufacturers' Association	A
801349	New Jersey Zinc Company	B
801398	Union Carbide Corporation	B
801431	Hercules, Incorporated	B
801577	National Agricultural Chemical Association	B
802684	State of Florida	B
802753	University of California - Berkeley	B
802872	American Defense Preparedness Association	B
802908	Louisiana Chemical Association	B
803026	American Oil Company	B
803085	The Dow Chemical Company	B
803159	Velsicol Chemical Corporation	B
803231	University of Connecticut	B
803286	Pfizer Pharmaceuticals, Incorporated	B
803357	International Ozone Institute, Inc.	B
803358	Crown Chemical Company	B

Project Status

A - Completed, Final Report Available
B - Project Ongoing
C - Project Discontinued

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DIS

TITLE OF PROJECT: Anaerobic Treatment of Synthetic Organic Wastes

GRANTEE OR CONTRACTOR:

Union Carbide Corporation
R&D Department
Bound Brook, New Jersey 08805

Project Site: South Charleston, West Virginia

EPA PROJECT OFFICER:

Mr. James Horn
R. S. Kerr Environmental
Research Laboratory, EPA
P. O. Box 1198
Ada, Oklahoma 74820

DESCRIPTION OF PROJECT

Award Date: December 1968

Completion Date: June 1971

Project Cost: $314,859

Federal Cost: $220,400

Summary:

The objective of this project was to determine the technical and economic feasibility of an anaerobic-aerobic process for the treatment of composite organic chemical wastes from a integrated petrochemical complex. Optimum results were demonstrated on a 5000-gpd scale treatment facility to obtain design data and establish operating criteria for larger scale installations. The demonstration was conducted subject to a technical and economic feasibility study based on laboratory-scale research studies.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DIT

TITLE OF PROJECT: Metal Ion-Catalyzed Oxidation of Phenols and Aromatic Amines

GRANTEE OR CONTRACTOR:

Texas A&M Research Foundation

EPA PROJECT OFFICER:

Mr. George Rey
Environmental Protection Agency
Ind. Pol. Control Division (RD-679)
Washington, D. C. 20460

Project Site: Texas A&M

DESCRIPTION OF PROJECT

Award Date: September 1967

Project Cost: $234,000

Completion Date: August 1972

Federal Cost: $40,265

Summary:

A study of the mechanism and feasibility of the metal ion-catalyzed oxidation of phenols and aromatic amines by molecular oxygen in wastewater systems partially treated with potassium permanganate was undertaken in this project.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DKF

TITLE OF PROJECT: State-of-the-Art Evaluation on Petroleum and Coal Wastes

GRANTEE OR CONTRACTOR:

University of Oklahoma Research Institute
1808 Newton Drive
Norman, Oklahoma 73069

EPA PROJECT OFFICER:

Mr. Leon Myers
R. S. Kerr Environmental
Research Laboratory, EPA
Ada, Oklahoma 74820

Project Site: Norman, Oklahoma

DESCRIPTION OF PROJECT

Award Date: October 1968

Project Cost: $17,897

Completion Date: April 1970

Federal Cost: $14,297

Summary:

The final report to this study presents a state-of-the-art evaluation of pollution problems, abatement procedures, and control techniques relevant to the petroleum and coal industries. Petroleum wastes are discussed under three broad sections: drilling-production, transportation and storage, and refining. The results of a field study of three small refineries are reported, providing additional information which delineates the characteristics of waste streams from individual processes within the refinery. - Coal mining, coal processing, and coal utilization, the wastes associated with each, and the corresponding control measures are discussed. Acid mine drainage, the most significant pollution problem from coal mining, and possible control measures are presented. The major pollution problems associated with coal processing originate from coal cleaning, the coking process, and refuse disposal. The principal pollutants in water discharged from the processing of coal are suspended solids usually in the form of fine clay, black shale, and other minerals commonly associated with coal. The production of coke by carbonization of coal produces a wastewater that is high in phenols, ammonia, and dissolved organics.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DML

TITLE OF PROJECT: Treatment of Refinery Effluent by a Unique Combination of Biological and Chemical Processes

GRANTEE OR CONTRACTOR:

American Oil Company
910 South Michigan Avenue
Chicago, Illinois

EPA PROJECT OFFICER:

Mr. Clifford Risley
Region V, EPA
1 North Wacker Drive
Chicago, Illinois 60606

Project Site: Whiting, Indiana

DESCRIPTION OF PROJECT

Award Date: February 1969

Project Cost: $1,737,775

Completion Date: September 1974

Federal Cost: $ 336,535

Summary:

A 30-mgd scale project to demonstrate the advantages of using chemical coagulation and air flotation following biological conditioning to provide refinery effluent of high quality was undertaken to establish what operating flexibilities exist in such a combination of processes and the costs associated therewith. Evaluation of a number of unique design features, including a hitherto unproven process for disposal of oily sludges, a unique and low-cost method for preventing sludge deposition in an aerated lagoon, a novel application of rotary-drum skimmers and a comparative study of alternate design features for air flotation, was also made.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DMT

TITLE OF PROJECT: The Characteristics and Pollutional Problems Associated with Petrochemical Wastes

GRANTEE OR CONTRACTOR:

Engineering Science, Inc.
150 East Foothill Boulevard
Arcadia, California 19006

EPA PROJECT OFFICER:

Mr. James Horn
R. S. Kerr Environmental
Research Laboratory
P. O. Box 1198
Ada, Oklahoma 74820

Project Site: Austin, Texas

DESCRIPTION OF PROJECT

Award Date: September 1968

Project Cost: $11,190

Completion Date: April 1969

Federal Cost: $11,190

Summary:

The general scope of the project, as developed under the plan of operation, includes a detailed development of the following: 1) History and projection of the petrochemical industry; 2) Definition, magnitude, and pollutants associated with these waste treatment problems; 3) Evaluation of control, treatment and disposal practices; 4) Listing of the special legal problems involved with petrochemical waste management; 5) Determination of the economic feasibility of present and future control methods, reflecting downstream uses; and 6) Evaluation of research needs. The objectives of this proposed project were achieved through a well coordinated plan of operation. A complete literature review was conducted using the numerous volumes available in the numerous libraries located on the University of Texas campus. Additional information was obtained from various governmental agencies and selected industries. Additional data derived from the unpublished Environmental Health Engineering Reports was also utilized.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DQC

TITLE OF PROJECT: Polymeric Materials for Treatment and Recovery of Petrochemical Wastes

GRANTEE OR CONTRACTOR:

Department of Commerce and
Industry
State of Louisiana

EPA PROJECT OFFICER:

Mr. James Horn
Robert S. Kerr Environmental
Research Laboratory, EPA
P. O. Box 1198
Ada, Oklahoma 74820

Project Site: Baton Rouge, Louisiana

DESCRIPTION OF PROJECT

Award Date: April 1969

Project Cost: $68,992

Completion Date: October 1970

Federal Cost: $48,295

Summary:

Reverse osmosis has been used as a unit operation to study the recovery of products from industrial waste streams. Precursory examination of several industrial wastes was performed in this project. - The recovery of glycerin from a petrochemical waste stream containing inorganics and polyglycerins has been studied in detail with the results applied to the design of an effective process scale unit. Membranes employed were asymmetric cellulose acetate butyrate and cellulose acetate. The pilot-scale experimental studies were performed with tubular membrane modules which readily accommodated the sample plant stream being studied. - Good separation was achieved operating between 600 and 800 psig for best selectivity. The product throughput rate appeared the limiting consideration and proved sensitive to increased turbulence and reduced feed vicosities, the latter achieved by dilution. - The pilot-unit data were used to design a countercurrent multi-stage battery to achieve even closer separations. It was shown that sufficient glycerin could be recovered to provide an attractive return on the required investment.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DRC

TITLE OF PROJECT: Efficiency of Fibrous Bed Coalescers

GRANTEE OR CONTRACTOR:

Department of Chemical Engineering
Illinois Institute of Technology
Chicago, Illinois 60616

EPA PROJECT OFFICER:

Mr. Clifford Risley
Region V, EPA
1 North Wacker Drive
Chicago, Illinois 60606

Project Site: Chicago, Illinois

DESCRIPTION OF PROJECT

Award Date: June 1970

Completion Date: June 1971

Project Cost: $41,665

Federal Cost: $34,999

Summary:

A 1 sq. ft. coalescer unit using filter press construction has been designed for removing dispersed oil from water and has been tested on both a synthetic stream and an actual pollutant stream. The oil removal efficiency was essentially 100 percent at a superficial velocity of 1 fpm. The present design is suitable for large-scale operation by the use of both mutiple cells and larger individual cells. - The performance of fiber glass coalescers was studied in depth using a cell with an active area of 1.77 sq. in. The commercial fibers, with phenol formaldehyde coatings and a fiber diameter of 3.2u, gave efficiencies of 90-99 percent with bed densities of 12 lb/ft^3 when operating at superficial velocities from 0.2 to 4 fpm on emulsions containing 50-500 ppm of oil. In all cases the pressure drop increased continually with run time due to both accumulation of oil in the bed and mechanical degradation of the fibers. Preliminary tests indicated that the bed degradation phenomenon could be eliminated by structurally stabilizing the compressed fibers with methacrylate resin.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DSH

TITLE OF PROJECT: Improved Capabilities of Biological Systems to Assimilate Oil

GRANTEE OR CONTRACTOR:

American Petroleum Institute
Air and Water Conservation
1801 K Street, N.W.
Washington, D. C. 20006

EPA PROJECT OFFICER:

Mr. Paul Lefcourt
Hudson-Delaware Basins Office
Environmental Protection Agency
Edison, New Jersey 08817

Project Site: New York, New York

DESCRIPTION OF PROJECT

Award Date: June 1968

Completion Date: December 1969

Project Cost: $84,990

Federal Cost: $51,470

Summary:

Small-scale, continuous activated sludge systems were exposed to a variety of oily compounds at several loading levels and the system performance was observed. Batch studies to determine the biodegradability of the oily compounds, and the effects of emulsification and temperature on the rate of biological reaction were also conducted. - As a result of this study, it was found that oils introduced into an activated sludge system are absorbed on the floc and are very slowly degraded. If the loading rate is higher than the degradation rate or the rate of wastage, the oil accumulates on the sludge. The accumulation causes a loss of density and then a loss of acceptable sludge settling characteristics. The biological system fails due to the loss of floc, but it is important to note that the ability of the biological system to remove other substrates is not inhibited by the presence of oil compounds until excessive loss of MLSS has occurred. The continuous feed level of oils to activated sludge should not exceed 0.10 pounds per day per pound of sludge under aeration. Shock loads should not exceed 5 per cent of the weight of the sludge under aeration. The study also considered separation of oils before biological treatment and various chemical methods of handling complex cases.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DXR

TITLE OF PROJECT: Oil Dispersion Coalescence by Porous Solid Contact

GRANTEE OR CONTRACTOR:

President & Fellows of Harvard College
Office of Research Contracts
1350 Massachusetts Avenue
Cambridge, Massachusetts 02138

EPA PROJECT OFFICER:

Mr. Richard Keppler
Region I, EPA
John F. Kennedy Federal Building
Boston, Massachusetts 02203

Project Site: Cambridge, Massachusetts

DESCRIPTION OF PROJECT

Award Date: February 1970

Completion Date: July 1971

Project Cost: $16,157

Federal Cost: $15,349

Summary:

The first year-report describes progress toward completion of a laboratory experimental and theoretical investigation of oil dispersion separation by filtration through packed beds. The end results of this study should be important to process design for treatment of waste aqueous oil dispersions such as those produced in industrial processing and ship ballast discharge.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EAS

TITLE OF PROJECT: Recondition and Reuse of Organically Contaminated Waste Sodium Chloride Brines

GRANTEE OR CONTRACTOR:

The Dow Chemical Company
1000 Main Street
Midland, Michigan 48640

EPA PROJECT OFFICER:

Mr. Clifford Risley
Region V, EPA
1 North Wacker Drive
Chicago, Illinois 60606

Project Site: Midland, Michigan

DESCRIPTION OF PROJECT

Award Date: June 1969

Completion Date: June 1971

Project Cost: $1,300,408

Federal Cost: $509,810

Summary:

The development and demonstration of a chemical-adsorption process for wastewaters from a phenol manufacturing plant were performed in this study. The process treated the wastewaters for the removal and recovery of phenol and acetate. The remaining brine wastewater was utilized for caustic-chlorine production. The basic process involves the selective separation of organic constituents by activated carbon beds.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EAW

TITLE OF PROJECT: Ocean Disposal of Industrial Wastes

GRANTEE OR CONTRACTOR:

E. I. duPont de Nemours and Company
Pigments Department
Wilmington, Delaware 19898

EPA PROJECT OFFICER:

Mr. John Ulshoefer
Edison Water Quality Res. Lab.
Environmental Protection Agency
Edison, New Jersey 08817

Project Site: Wilmington, Delaware

DESCRIPTION OF PROJECT

Award Date: July 1969

Completion Date: September 1974

Project Cost: $874,452

Federal Cost: $150,116

Summary:

In this project, the various technical and economic aspects of the dispersal of an acid-iron industrial waste at sea over the continental shelf of the Atlantic off the coast of Delaware, was evaluated.

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EEQ

TITLE OF PROJECT: Treatment of Wastewaters Resulting from the Production of Polyhydric Organic Compounds

GRANTEE OR CONTRACTOR:

The Dow Chemical Company
Texas Division
Freeport, Texas

EPA PROJECT OFFICER:

Mr. James Horn
Robert S. Kerr Environmental
Research Laboratory, EPA
P. O. Box 1198
Ada, Oklahoma 74820

Project Site: Freeport, Texas

DESCRIPTION OF PROJECT

Award Date: June 1969

Completion Date: June 1971

Project Cost: $282,490

Federal Cost: $197,740

Summary:

The basic goal in this project was to develop a method of treatment of wastes from polyhydric manufacturing processes. Several alternative treatment methods were examined to determine their technical engineering, and economic feasibility. The results will be used to develop a conceptual design of a waste treatment facility for the briny wastes resulting from this chemical industry. Processes evaluated were aerobic biological systems, solvent extraction, foam fractionation, dialysis, and adsorption. Studies included laboratory, bench-scale, and pilot-plant scale testing.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EPW

TITLE OF PROJECT: Armour Industrial Chemical Company Secondary Wastewater Treatment

GRANTEE OR CONTRACTOR:

Armour Industrial Chemical Co.
Chicago, Illinois 60611

EPA PROJECT OFFICER:

Mr. Clifford Risley
Region V, EPA
1 North Wacker Drive
Chicago, Illinois 60606

Project Site: McCook, Illinois

DESCRIPTION OF PROJECT

Award Date: October 1969

Completion Date: December 1974

Project Cost: $503,000

Federal Cost: $210,500

Summary:

The development and demonstration of a secondary treatment biological process to reduce the effluent from a fatty acid derivatives chemical plant to less than 100 ppm of hexane soluble materials will be undertaken. Development work includes the evaluation of an existing pilot-plant test unit, to be followed by a full-scale (0.5 mgd) demonstration at the Armour plant in McCook, Illinois. The treated effluent water quality improvement, obtainable by use of a tertiary treatment process, will also be explored on a pilot scale.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EGC

TITLE OF PROJECT: Treatment and Disposal of Complex Chemical Wastes

GRANTEE OR CONTRACTOR:

State of Alabama
Geological Survey and Oil & Gas Board
University, Alabama

EPA PROJECT OFFICER:

Mr. Edmond Lomasney
Region IV, EPA
1421 Peachtree Street, N.E.

Project Site: Tuscaloosa, Alabama

DESCRIPTION OF PROJECT

Award Date: October 1969

Project Cost: $989,525

Completion Date: September 1974

Federal Cost: $314,525

Summary:

In this program, development and evaluation of a surface or subsurface method for control of pollution from a complex chemical waste from a petrochemical complex, manufacturing alkyd resins and phenols, will be performed. Development of the methodology and/or testing techniques to permit projections of the fate of waste components and the waste assimulative capacity of deep geological formations will be also made.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EGM

TITLE OF PROJECT: Removal of Nitrogenous Compounds from a Fertilizer Plant Effluent

GRANTEE OR CONTRACTOR:

Farmers Chemical Association, Inc.
P. O. Box 87
Harrison, Tennessee

EPA PROJECT OFFICER:

Mr. Edmond Lomasney
Region IV, EPA
1421 Peachtree Street, N.E.
Atlanta, Georgia 30309

Project Site: Tyner, Tennessee

DESCRIPTION OF PROJECT

Award Date: April 1969

Completion Date: June 1975 (revised)

Project Cost: $220,300

Federal Cost: $154,210

Summary:

This project involves the full-scale development and demonstration of the treatment of nitrogenous fertilizer effluents using stripping, oxidation pretreatment and ion exchange/recovery reuse techniques. Present objective of this project is to determine the efficiency and operating costs of a moving bed ion exchange system in removing nitrogenous compounds from the nitrogen fertilizer plant effluent.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EID

TITLE OF PROJECT: Preliminary Investigational Requirements - Petrochemical and Refinery Waste Treatment Facilities

GRANTEE OR CONTRACTOR:

Engineering Science, Inc.
150 East Foothills Boulevard
Arcadia, California 91006

EPA PROJECT OFFICER:

Mr. George Putnicki
Region VI, EPA
Dallas, Texas 75202

Project Site: Austin, Texas

DESCRIPTION OF PROJECT

Award Date: June 1969

Project Cost: $17,000

Completion Date: March 1970

Federal Cost: $17,000

Summary:

The objectives of this project included the compilation, interpretation, and presentation of the pertinent aspects which constitute a preliminary wastewater treatability study for the refining and petrochemical industries. The preliminary investigation relative to the successful treatment of petrochemical and refinery wastewaters included those factors essential in the proper development of design criteria for pollution abatement and control facilities.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EJI

TITLE OF PROJECT: Inorganic Chemical Industry Profile

GRANTEE OR CONTRACTOR:
Datagraphics, Incorporated
4790 William Flynn Highway
Allison Park, Pennsylvania

EPA PROJECT OFFICER:
Mr. George Rey
Industrial Pollution Control
Division (RD-679), EPA
Washington, D. C. 20460

Project Site: Pittsburgh, Pennsylvania

DESCRIPTION OF PROJECT

Award Date: June 1969

Completion Date: January 1970

Project Cost: $55,327

Federal Cost: $55,327

Summary:

The final report to this project presents a description of the inorganic chemical industry and the costs that the industry would incur in attaining various levels of pollution abatement over the five-year period through 1974. For the study purposes, the inorganic chemical industry has been defined as including establishments producing alkalies and chlorine, industrial gases, inorganic pigments, paints and allied products, fertilizers (excluding ammonia and urea), inorganic insecticides and herbicides, explosives, and other major industrial inorganic chemicals. The report presents in considerable detail the description of the various production processes, the waste treatment methods practiced, and the possible impact that changes in processes might have on the volume and character of the wastes produced.

Projections have been based upon the chemical industry data in the 1963 and 1967 Census of Manufacturers, the 1967 Manufacturing Chemists Assoc. survey, and the 1968 FWPCA study of the organic chemicals industry. Costs of treatment are estimated by year for the levels of treatment corresponding to 27 percent and 100 percent removal of contaminants. Data from 59 inorganic chemical plants were obtained as primary input to the study.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EKT

TITLE OF PROJECT: Fluid Bed Incineration of Petroleum Refinery Wastes

GRANTEE OR CONTRACTOR:

American Oil Company
910 S. Michigan Avenue
Chicago, Illinois 60680

EPA PROJECT OFFICER:

Mr. Otmar Olson
Region VII, EPA
911 Walnut Street
Kansas City, Missouri 64106

Project Site: Mandan, North Dakota

DESCRIPTION OF PROJECT

Award Date: February 1968

Project Cost: $354,530

Completion Date: December 1970

Federal Cost: $170,265

Summary:

The applicability of the fluid bed incineration process for the disposal of petroleum refinery generated spent caustic and oily sludge in a commercial-scale unit has been demonstrated under this project. Operating problems have been studied. Design and operating procedural changes are suggested in the final report.

The major process limitation stems from the loss of bed fluidity due to high particle size growth rate. Particle size growth rate is directly proportional to the particle diameter and rate of dissolved solid material charged and inversely proportional to the mass of material in the bed. The average particle diameter can be controlled by (1) Collecting and continuously returning fine material to the bed, (2) Utilizing an effective attriting system, and (3) Limiting superficial space velocity to avoid elutriation of fines.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EMI

TITLE OF PROJECT: Concentration and Removal of Industrial Wastes by Dialysis

GRANTEE OR CONTRACTOR:

State of Louisiana
Department of Commerce and Industry

EPA PROJECT OFFICER:

Mr. James Horn
Robert S. Kerr Environmental
Research Laboratory, EPA
P. O. Box 1198
Ada, Oklahoma 74820

Project Site: New Orleans, Louisiana

DESCRIPTION OF PROJECT

Award Date: April 1970

Project Cost: $67,263

Completion Date: June 1974

Federal Cost: $32,539

Summary:

The objectives of the proposed research were the following: 1) Investigation of the phenomenon of dialysis with a view toward developing a satisfactory theory of selective migration and generating an appropriate mathematical statement. 2) Comparison of the efficiency of various types of dialysis equipment with respect to selectivity and mobility of solute particles in various media and thereby to develop parameters by which dialyzer membrane and optimal operating conditions can be determined for a number of typical industrial waste streams. 3) Evaluation of the economics of dialysis as a tool in removing pollutants from industrial wastes and concentrating them to the extent that recoverability becomes feasible. 4) Design of dialysis equipment for continued research and for pilot plant scale studied for possible industrial applications.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EPH

TITLE OF PROJECT: Anaerobic-Aerobic Chemical Waste Treatment

GRANTEE OR CONTRACTOR:

Celanese Corporation of America
522 Fifth Avenue
New York, New York 10036

EPA PROJECT OFFICER:

Dr. Thomas Short
R. S. Kerr Environmental
Research Laboratory, EPA
Ada, Oklahoma 74820

Project Site: Bay City, Texas

DESCRIPTION OF PROJECT

Award Date: June 1971

Completion Date: December 1975

Project Cost: $600,000

Federal Cost: $395,340

Summary:

The proposed project will study and demonstrate the economics and process parameters of a bio-oxidation disposal system for high-strength organic wastes on a commercial scale and compare the economics to deep-well disposal. Additionally, the project will: 1) Investigate the anaerobic conversion of intractable organic compounds to aerobically bio-degradable species to reduce the COD and BOD to levels suitable for discharge to receiving waters or for reuse. 2) Study the nitrate removal characteristics of the anaerobic-aerobic systems. 3) Demonstrate the use of automatic on-stream total organic carbon analyzers as process controllers and/or monitors. 4) Investigate the effects of series and parallel operation, changes in recycle rates, and dilution on the process efficiency.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: ERM

TITLE OF PROJECT: Ion-Exchange Effluent Treatment Unit (PET)

GRANTEE OR CONTRACTOR:

Mineral Pigments Corporation
Muirkirk, Maryland

EPA PROJECT OFFICER:

Mr. John Ciancia
Edison Water Quality
Research Laboratory, EPA
Edison, New Jersey 08817

Project Site: Muirkirk, Maryland

DESCRIPTION OF PROJECT

Award Date: October 1969

Completion Date: July 1969

Project Cost: $226,422

Federal Cost: $115,967

Summary:

Development and demonstration of the use of an ion-exchange process for recovery of chromate from chromate wastewaters containing high concentrations (1000 ppm) of chromate was undertaken. The proposed process was one which is used for dilute chromate content cooling tower waters.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EXG

TITLE OF PROJECT: The Effects of Chlorination on Treated Organic Chemicals

GRANTEE OR CONTRACTOR:

Manufacturing Chemists Assoc., Inc.
1825 Connecticut Avenue, N.W.
Washington, D. C. 20009

EPA PROJECT OFFICER:

Dr. Hend Gorchev
Region I, EPA
John F. Kennedy Federal Building
Boston, Massachusetts 02203

Project Site: Leonia, New Jersey 07650

DESCRIPTION OF PROJECT

Award Date: March 1970

Project Cost: $60,000

Completion Date: June 1971

Federal Cost: $42,000

Summary:

The basic objectives of this project were to conduct a study to determine any adverse effects that might result from the chlorination of certain industrial chemicals either before or after biological treatment. More specific aims included the following:

1. Evaluation of the effect of selected organic chemicals and their degradation products on chlorine demand and disinfection efficiency.
2. Determination, for selected chemicals, of cases in which it is possible to form chlorinated compounds during disinfection of the treated effluent.
3. Determination of the physical properties and degradation rate of chlorinated compounds found.
4. Examination of the influence of persistent chlorinated compounds on the stream biota, in which several levels of life forms were considered.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EZG

TITLE OF PROJECT: Demonstration of Oily Waste Disposal by Soil Cultivation Process

GRANTEE OR CONTRACTOR:

Shell Oil Company
P. O. Box 100
Deer Park, Texas 77536

EPA PROJECT OFFICER:

Mr. Leon Myers
R. S. Kerr Env. Res. Laboratory
P. O. Box 1198
Ada, Oklahoma 74820

Project Site: Deer Park, Texas

DESCRIPTION OF PROJECT

Award Date: March 1970

Completion Date: January 1972

Project Cost: $100,000

Federal Cost: $ 70,000

Summary:

The project consisted of a series of experiments on the treatment of oily sludges (crude tank bottoms, Bunker C, intermediate wax oils) by spreading and cultivation into soil under prevailing climatic conditions. Nine test plots were operated at specific nutrient addition levels. The objectives were to determine: 1) Decomposition rates of various types of oily waste sludges. 2) Effectiveness of adding nutrient supplements. 3) Major microbiological species active in the soil. 4) Cost of the process for the disposal of oily waste. 5) Depth of oil penetration into the soil. - The demonstration phase followed a six-month pilot phase for optimization of waste loading rates and nutrient addition.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: FER

TITLE OF PROJECT: Identification and Control of Petrochemical Pollutants Inhibiting Anaerobic Treatment Processes

GRANTEE OR CONTRACTOR:

Union Carbide Corporation
Research and Development Dept.
P. O. Box 8361
South Charleston, West Virginia 25303

EPA PROJECT OFFICER:

Mr. J. H. Ferguson
Water Quality Office, EPA
303 Methodist Building
Wheeling, West Virginia 26003

Project Site: South Charleston, West Virginia

DESCRIPTION OF PROJECT

Award Date: February 1970

Project Cost: $67,050

Completion Date: December 1971

Federal Cost: $46,936

Summary:

The objectives of this project was to identify chemicals in the wastewater from a large petrochemical plant that are inhibitory to anaerobic treatment and to study applicable means to eliminate such inhibition. As an initial step, inhibitory chemicals were identified by performing batch degradability studies in conjunction with analysis by the latest methods available at the Union Carbide Technical Center in South Charleston, West Virginia. Materials of particular interest were sulfates, B-unsaturated carbonyl compounds, and ammonia. A second study involved the use of a photosynthetic bacterial-algal culture to overcome sulfide problems (i.e. microbial inhibition and oxygen demand). Digestion studies in which a degradable substrate was spiked with various levels of inhibitory materials was made to indicate allowable levels. A final demonstration run in pilot facilities using typical wastewaters was planned to verify the findings of the laboratory study.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: FOH

TITLE OF PROJECT: Biological/Physico-Chemical Treatment Alternatives for a Diversified Organic Chemicals Wastewater

GRANTEE OR CONTRACTOR:

CIBA-Geigy Corporation
Ardsley, New York 10502

EPA PROJECT OFFICER:

Mr. D. H. Stonefield
Surveillance and Analysis Division
240 Highland Avenue
Needham, Massachusetts 02194

Project Site: Cranston, Rhode Island

DESCRIPTION OF PROJECT

Award Date: March 1970

Project Cost: $1,268,300

Completion Date: December 1974

Federal Cost: $392,600

Summary:

The objectives of this project were: 1) Demonstration of the feasibility of a multi-stage (three or more) plastic media trickling filter process for wastewaters from multiple organic chemicals plant. 2) Development and demonstration of the technical feasibility of total process control by automated systems for the process. 3) Evaluation of the performance of a specific design of plastic media. 4) Demonstration of the stage-wise acclimation of micro-organisms as a factor in attaining extra high loading per unit of trickling filter packing. 5) Evaluation of the performance of an additional treatment operation for further effluent quality improvement.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: FPD

TITLE OF PROJECT: Water Pollution and Its Control in the Inorganic Fertilizer and Phosphate Mining Industries

GRANTEE OR CONTRACTOR:

Battelle-Northwest
P. O. Box 999
Richland, Washington

EPA PROJECT OFFICER:

Mr. Thomas Sargent
Southeast Environmental
Research Laboratory, EPA
College Station Road
Athens, Georgia 30601

Project Site: Richland, Washington

DESCRIPTION OF PROJECT

Award Date: April 1970

Project Cost: $24,750

Completion Date: September 1971

Federal Cost: $23,500

Summary:

A state-of-the-art survey was made of the water pollution problems which result from the production of inorganic fertilizers. Information required to complete the study was obtained through an extensive literature search, questionnaires sent to the major fertilizer producers, and visits to selected production plants. Ninety-eight plants representing 33 different companies were surveyed. Production figures since 1940 and estimates of production through 1980 were accumulated for phosphate rock and the major fertilizer products. The specific production operations which are the principal generators of contaminated wastewaters were identified, and the wastewater volumes and compositions for each operation were determined wherever possible. The capability of current technology to treat and control the contaminated wastewaters generated by the fertilizer industry was evaluated. Problem areas where additional research and development effort is needed to provide adequate control of wastewater discharge were identified.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: FYE

TITLE OF PROJECT: Characteristics and Pollutional Problems of Pesticide Manufacturing Wastes

GRANTEE OR CONTRACTOR:

Department of Civil Engineering
University of Texas
Austin, Texas

EPA PROJECT OFFICER:

Mr. Thomas Sargent
Southeast Environmental
Research Laboratory, EPA
College Station Road
Athens, Georgia 30601

Project Site: Austin, Texas

DESCRIPTION OF PROJECT

Award Date: June 1970

Completion Date: December 1971

Project Cost: $26,183

Federal Cost: $28,143

Summary:

In this project a state-of-the-art study and survey was conducted on practices and research needs pertaining to wastewater treatment and pollution control technology related to pesticide-herbicide manufacturing industry.

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: GIZ

TITLE OF PROJECT: Biological Oxidation and Chemical Coagulation of Dyestuff and Organic Chemical Wastes

GRANTEE OR CONTRACTOR:

Southern Dyestuff Company
Division of Martin Marietta Corp.
P. O. Box 10098
Charlotte, North Carolina 28201

Project Site: Charlotte, North Carolina

EPA PROJECT OFFICER:

Mr. Edmond Lomasney
Region IV, EPA
1421 Peachtree Street, N.E.
Atlanta, Georgia 30309

DESCRIPTION OF PROJECT

Award Date: February 1971

Project Cost: $1,515,900

Completion Date: July 1973

Federal Cost: $ 501,122

Summary:

The grantee will design, construct, operate, and evaluate a waste treatment system for the control of wastes from a textile dyestuff and organic chemicals plant. The plant produces over 200 different dyestuff products and more than 40 aromatic organic chemicals. The plant will be designed to handle a flow of 2.2 mgd with a BOD of 760 mg/l, a COD of 1750 mg/l, suspended solids of 350 mg/l, and a high color content. The waste treatment system consists of biological decomposition of a thiosulfate waste stream, pH control of acid and alkaline waste streams, and biological oxidation, coagulation and clarification of the combined wastes. The system will be operated for a 12-month period in order to determine the unit process operating parameters and system characteristics.

In addition, pilot-plant studies will be conducted to determine the basic design factors needed to upgrade the system's treatment capabilities for color removal.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: GND

TITLE OF PROJECT: Projected Wastewater Treatment Costs in the Organic Chemical Industry

GRANTEE OR CONTRACTOR:

Datagraphics, Incorporated
4790 William Flynn Highway
Allison Park, Pennsylvania

EPA PROJECT OFFICER:

Mr. George Rey
Environmental Protection Agency
Ind. Pollution Control Div. (RD-679)
Washington, D. C. 20460

Project Site: Pittsburgh, Pennsylvania

DESCRIPTION OF PROJECT

Award Date: October 1970

Project Cost $6,735

Completion Date: June 1971

Federal Cost: $6,735

Summary:

The final report to this project presents a description of the organic chemical industry and the costs the industry would incur in attaining various levels of pollution abatement over the five-year period through 1974. For the study purposes, the organic chemical industry has been defined as SIC 2815 (cyclic intermediates, dyes, organic pigments (lakes and toners), and cyclic (coal tar) crudes); SIC 2818 (organic chemicals, not elsewhere classified); portions of SIC 2813 (industrial gases); portions of SIC 2879 (agricultural chemicals, not elsewhere classified); and portions of SIC 2871 (fertilizers). Organic gases only were included from SIC 2813 and ammonia and urea only from the fertilizer industry. The report presents in considerable detail the description of the various production processes, the waste treatment methods practiced, and the possible impact that changes in processes might have on the volume and character of the wastes produced.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: GTR

TITLE OF PROJECT: Refinery Effluent Water Treatment Plant (Calgon Filtrasorb System)

GRANTEE OR CONTRACTOR:

Atlantic Richfield Company
260 Broad Street
Philadelphia, Pennsylvania 19101

EPA PROJECT OFFICER:

Mr. Leon Myers
R. S. Kerr Environmental
Research Laboratory
P. O. Box 1198
Ada, Oklahoma 74820

Project Site: Wilmington, California

DESCRIPTION OF PROJECT

Award Date: July 1971

Project Cost: $1,159,584

Completion Date: January 1974

Federal Cost: $ 274,719

Summary:

This project will demonstrate and evaluate the effectiveness and economics of a non-biological system (activated carbon) for periodic treatment of refinery process and storm water runoff. The system is designed to relieve the hydraulic and waste loading of a municipal system, normally used for joint treatment during dry weather conditions, during peak flow storm periods. - The system is a parallel downflow granular activated carbon system, including carbon regenerations designed to directly treat 4.2 mgd of wastewater, reducing the chemical oxygen demand over 90 percent to an effluent value less than 40 mg/l. In addition, the effluent water quality resulting will be in compliance with the effluent quality regulations imposed by the California Water Quality Board for the Dominguez Channel.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: GXF

TITLE OF PROJECT: Treatment of Oil Refinery Wastewaters for Reuse Using a Sand Filter-Activated Carbon System

GRANTEE OR CONTRACTOR:

B. P. Oil Corporation
P. O. Box 428
Marcus Hook, Pennsylvania 19061

Project Site: Marcus Hook, Pennsylvania

EPA PROJECT OFFICER:

Mr. Leon Myers
R. S. Kerr Environmental
Research Laboratory
P. O. Box 1198
Ada, Oklahoma 74820

DESCRIPTION OF PROJECT

Award Date: July 1971

Completion Date: January 1975

Project Cost: $2,625,240

Federal Cost: $ 350,000

Summary:

Project objectives include: 1) Demonstration of the unique application of sand filtration followed by activated carbon adsorption for total treatment of refinery wastewaters. 2) Demonstration of the use of two-stage centrifugation for sludge dewatering and oil recovery from the centrate. 3) Investigation of the practicality of the reuse of treated effluent within the refinery. 4) Collection of reliable operating data from full-scale facilities including capital and operating costs of treatment facilities; and 5) Investigation of the reuse of treated effluent for cooling tower and boiler feed water makeup.

The project plan will be to design, construct, and operate a refinery wastewater treatment facilities consisting of sand filtration and activated carbon adsorption. The design is to be based on information gathered during prior pilot-scale evaluation of sand filter-activated carbon system. The project will demonstrate the feasibility of use of sand filter-activated carbon system for treatment of refinery wastewaters as an alternate to the conventional biological treatment.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 14-12-435

TITLE OF PROJECT: Cost-Effectiveness of Industrial Wastewater Treatment Practices

GRANTEE OR CONTRACTOR:

C. W. Rice and Company
15 Noble Avenue
Pittsburgh, Pennsylvania 15205

EPA PROJECT OFFICER:

Mr. George Rey
Environmental Protection Agency
Industrial Pollution (RD-679)
Washington, D. C. 20460

Project Site: Pittsburgh, Pennsylvania

DESCRIPTION OF PROJECT

Award Date: June 1968

Completion Date: October 1968

Project Cost: $56,250

Federal Cost: $56,250

Summary:

The final report to this project presents an estimate of the costs that would be incurred by the organic chemicals industry in attaining various levels of pollution abatement over a five-year period and gives a generalized methodology by which similar continuing estimates can be made for other water-using industries. Cost estimates have been based upon published data, general data derived from information in the files of the contractors on industrial waste treatment methods and costs, and specific data from 53 organic chemicals plants; the latter specific data were used to verify the applicability and accuracy of the former and also to develop and test the generalized methodology. - It should be emphasized that the total costs given in this report are for the construction and operation of waste treatment facilities for the industry as a whole and cannot be used to determine costs for individual plants. Organic chemical plants vary great in size, level of technology, product mix, etc., and a "typical" or "average" plant exists only in a statistical sense. The costs given are, in general, for waste treatment facilities only, i.e., for "battery limit" industrial waste treatment plants. The costs entailed in process changes, disruption of plant operations, sewer segregation, monitoring and reporting waste treatment efficiency, etc., particularly in older plants, are not included. Such costs are practically impossible to estimate in the aggregate and may add 40 percent or more to the installed costs of facilities.

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 5-532-1

TITLE OF PROJECT: Physico-Chemical Treatment of Industrial Wastewater and Sludge Utilization

GRANTEE OR CONTRACTOR:
Ministry of Land Resources
and Environmental Protection
Katowice, Poland

EPA PROJECT OFFICER:
Dr. Herbert S. Skovronek
Edison Water Quality Research
Laboratory
Edison, New Jersey 08817

Project Site: Katowice, Poland

DESCRIPTION OF PROJECT

Award Date: January 1973

Completion Date: December 1975

Project Cost: $85,400

Federal Cost: $85,400

Summary:

This project will develop, on a laboratory and pilot-plant scale, physico-chemical treatment for combined municipal and industrial (primarily steel mill) wastewater. Sludges available from the current primary wastewater treatment, themselves a local environmental problem, are high in iron and should be useful as the coagulant for such treatment. The extent to which the sludges must be dewatered and/or chemically modified to make them suitable for this purpose and the effectiveness of physico-chemical treatment for this wastewater, including multi-media filtration, will be established. Biological treatment will also be evaluated for comparison.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 68-01-0083

TITLE OF PROJECT: Development of Treatment Process for Chlorinated Hydrocarbon Pesticide Manufacturing and Processing Wastes

GRANTEE OR CONTRACTOR:

Envirogenics Systems
9200 East Flair Drive
El Monte, California 91734

EPA PROJECT OFFICER:

Dr. Robert R. Swank
Southeast Environmental Research Laboratory
College Station Road
Athens, Georgia 30601

Project Site: El Monte, California

DESCRIPTION OF PROJECT

Award Date: June 1971

Completion Date: August 1974

Project Cost: $328,640

Federal Cost: $328,640

Summary:

Objective - To develop and demonstrate through the bench scale (1.5 gpm) chemical degradation treatment processes for DDT, toxaphene, and chlordane aqueous pesticide manufacturing and processing wastes. Specific targets for the processes include a 99% or greater conversion of DDT (and major isomers) to products of demonstratably reduced hazard to the environment and 95% for toxaphene and chlordane. Process definition and equipment design for DDT wastes are to be completed for possible pilot-full scale implementation. Lab scale screening test data on "in-situ" metal/bimetal couple-catalyzed reduction of chlorinated pesticides in aqueous wastes will be used for scale-up to the commercialization design stage. The work focuses on chlorinated cyclodiene pesticides: heptachlor; endrin; chlordane; and toxaphene. Continuous bench scale studies using actual manufacturing plant wastes is being used to provide both the engineering control/design (scaleup) data and process economics needed for the ultimate mini-works--full scale design (100 gpm) and demonstration phases.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 68-01-0457 (USAF/EPA Interagency Agreement No. EPA-IAG-008(R))

TITLE OF PROJECT: Study of Feasibility of Herbicide ORANGE Chlorinolysis

GRANTEE OR CONTRACTOR:

Diamond Shamrock Corporation
T. R. Evans Research Center
Painesville, Ohio 44077

EPA PROJECT OFFICER:

Dr. Robert R. Swank
Southeast Environmental Research Laboratory
College Station Road
Athens, Georgia 30601

Project Site: Painesville, Ohio

DESCRIPTION OF PROJECT

Award Date: December 1972

Completion Date: February 1974

Project Cost: $34,700

Federal Cost: $34,700

Summary:

A process termed chlorinolysis (exhaustive chlorination) was applied to samples of USAF Herbicide ORANGE. The ORANGE (50/50 volume mixture of the n-butyl esters of 2,4-D and 2,4,5-T) contained a production impurity called dioxin - a powerful teratogen. - The research objective was to demonstrate the feasibility of converting such herbicides into marketable products, namely, carbon tetrachloride (CCl_4), carbonyl chloride ($COCl_2$), and hydrogen chloride (HCl), while destroying any dioxin present. - Bench scale (100 g/hr) chlorinolysis of ORANGE was evaluated over a range of reactor conditions. The critical reaction parameters were found to be: chlorine to carbon ratio (4.4 - 7.2); temperature (600 - 800°C); pressure (225 - 300 psig); and retention time (0.5 - 1.0 minute). - Thermodynamic analysis had indicated that CCl_4, hexachlorobenzene (HCB), and chlorine (Cl_2) would exist in equilibrium at the reaction conditions utilized. Because of the balance required between reaction rate (reactor size) and HCB content of the effluent, recycle of unconverted HCB from the product recovery system was found to be necessary. Recycle tests indicated that single pass HCB conversion rates of 80% could be realized.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 68-03-0456

TITLE OF PROJECT: Conversion of Chlorocarbon and Pesticide Wastes by Complete or Partial Chlorinolysis

GRANTEE OR CONTRACTOR:

REPRO Chemical Corporation
1629 K Street, N.W.
Washington, D. C. 20006

Project Site: Washington, D. C.

EPA PROJECT OFFICER:

Dr. Robert R. Swank
Southeast Environmental Research Laboratory
College Station Road
Athens, Georgia 30601

DESCRIPTION OF PROJECT

Award Date: May 1974

Project Cost: $48,400

Completion Date: December 1974

Federal Cost: $48,400

Summary:

Task 1 - Definition of the magnitude of the United State's organic waste disposal problem with specific reference to chlorinolysis feedstock potential.

Task 2 - Definition of the impact of chlorinolysis conversion products, carbon tetrachloride, carbonyl chloride, and anhydrous hydrochloric acid, on their respective markets.

Task 3 - Based upon the results of Tasks 1 and 2, provide recommendations as to the most cost effective routes for future chlorinolysis process development, testing, and implementation.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 68-03-2133

TITLE OF PROJECT: Chlorolysis Applied to the Conversion of Defoliants/Chlorocarbon Residues

GRANTEE OR CONTRACTOR:

Hoechst-Uhde Corporation
560 Sylvan Avenue
Englewood Cliffs, New Jersey 07632

EPA PROJECT OFFICER:

Dr. Robert R. Swank
SERL, EPA
College Station Road
Athens, Georgia 30601

Project Site: Hoechst, West Germany

DESCRIPTION OF PROJECT

Award Date: August 1974

Project Cost: $41,000 (est.)

Completion Date: December 1974

Federal Cost: $25,000

Summary:

The purposes of the program study are to determine whether herbicides used as defoliants (TCP) can be converted into carbon tetrachloride by means of technology developed by Farbwerke Hoechst AG (for chlorinated residues wastes) and whether the byproduct dioxin in TCP is converted into an inert product. In order to achieve high yield (more than 99%) of carbon tetrachloride and minimal byproduct dioxin it will be necessary to mix TCP with residues of the production of EDC and/or propylene oxide and the program will attempt to establish guidelines on the percentage of residues required.

This program will help establish whether technology developed by Farbwerke Hoechst AG and known as Chlorolysis (for conversion of chlorinated residue wastes to carbon tetrachloride) can be applied to the conversion of defoliants without byproduct dioxins in harmful concentration and amounts.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 800300

TITLE OF PROJECT: Ultraviolet Chlorination of Organic Acids in Waste Brines

GRANTEE OR CONTRACTOR:

The Dow Chemical Co.
Midland, Mn. 48640

EPA PROJECT OFFICER:

Dr. Robert R. Swank
Southeast Environmental
Research Laboratory
College Station Road
Athens, Georgia 30601

Project Site: Midland, Michigan

DESCRIPTION OF PROJECT

Award Date: June 1972

Completion Date: April 1974

Project Cost: $201,733

Federal Cost: $108,250

Summary:

The objectives of this demonstration project are to evaluate: 1) Effects of ultraviolet light placement, chlorine concentration operating temperature, and flow rate on removal efficiency; 2) Vent gas composition; 3) Corrosive effects of process streams on the equipment: 4) Large scale instrumentation requirements; and 5) Treatment chemical unit ratios.

In addition to the above demonstration study on the removal of acetic acid from waste brines by UV chlorination, laboratory studies will be conducted in a mini-plant reactor to determine the applicability of the process to other aliphatic acids, namely, glycolic, lactic, chloroacetic, propionic, and butyric acids. These additional studies will entail determination of: 1) Reaction rates as a function of pH at a temperature of 95°C and acid concentrations in the range of 1,000 - 2,000 mg/l at a constant Cl_2 concentration of 10 mg/l; 2) Optimum pH for each acid; 3) Chloride ion dependence: 4) Quantum yields of glycolic and lactic acids and comparison of results with no UV usage; and 5) Vent gas material balance by mass spectroscopy.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 800312

TITLE OF PROJECT: Radiation Treatment of High Strength Chlorinated Hydrocarbon Wastes

GRANTEE OR CONTRACTOR:
Georgia Institute of Technology
Atlanta, Georgia 30332

EPA PROJECT OFFICER:
Dr. Robert R. Swank
Southeast Environmental Research Laboratory
College Station Road
Athens, Georgia 30601

Project Site: Atlanta, Georgia

DESCRIPTION OF PROJECT

Award Date: October 1972

Project Cost: $76,055

Completion Date: September 1974

Federal Cost: $71,380

Summary:

Project Objectives: 1) To investigate the feasibility of using ionizing radiation alone or in combination with chemical agents for the treatment of waste effluents resulting from the manufacture of chlorinated hydrocarbons; 2) To study the products remaining after treatment to determine if their pre-irradiation resistance and/or toxicity to treatment plant biota have been sufficiently reduced to make them amenable to ordinary biological waste treatment; 3) To design and construct a small pilot-scale flow-through system (100 GPH) for continuous irradiation of solutions; and 4) To estimate costs of constructing and operating a full-scale irradiator.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 800554

TITLE OF PROJECT: Carbon Sorption and Regeneration for Petrochemical Waste Treatment

GRANTEE OR CONTRACTOR:
University of Missouri
Columbia, Missouri 65201

EPA PROJECT OFFICER:
Mr. L. Frank Mayhue
R. S. Kerr Environmental
Research Laboratory
P. O. Box 1198
Ada, Oklahoma 74820

Project Site: Columbia, Missouri

DESCRIPTION OF PROJECT

Award Date: March 1972

Project Cost: $38,520

Completion Date: April 1974

Federal Cost: $36,444

Summary:

The subject proposal is a two part program: (1) To determine the specific response of spent activated carbon to regeneration, and (2) To develop and fabricate two carbon adsorption pilot plants. A departure from the traditional empirical approach to activated carbon regeneration will be made in an effort to evaluate the basic parameters, techniques, and requirements of the regeneration process. The successful completion of the project will make a significant contribution to the understanding of regeneration phenomena. An optimum economic utilization of the overall carbon adsorption process will be the end result, thereby placing an enhanced value on its use in industrial waste treatment activities.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 800602

TITLE OF PROJECT: Waterborne Wastes of the Paint and Pigments Industry

GRANTEE OR CONTRACTOR:

Southern Research Institute
2000 Ninth Avenue South
Birmingham, Alabama 35205

EPA PROJECT OFFICER:

Dr. Herbert S. Skovronek
Edison Water Quality Research
Laboratory, EPA
Edison, New Jersey 08817

Project Site: Birmingham, Alabama

DESCRIPTION OF PROJECT

Award Date: June 1972

Completion Date: March 1973

Project Cost: $35,815

Federal Cost: $33,000

Summary:

The objectives of the proposed research program are: 1) To characterize the subject industries in relation to their wastewater problems; 2) To assess the waste-control technology currently being employed in the subject industries; 3) To determine the best practice now extant; 4) To determine what can be achieved in the way of control of effluent quality with technology now available to these industries, and 5) To recommend remedial measures where present treatment technology is either deficient, lacking, or nonexistent. It is anticipated that through pursuit of these objectives it will be possible to define clearly the pollutant-control problems of the Paint and Pigments Industries and to provide a sound basis for the planning of future research and development efforts necessary to the resolution of those problems.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 800766

TITLE OF PROJECT: Optimizing a Petrochemical Waste Bio-Oxidation System Through Automation

GRANTEE OR CONTRACTOR:

The Dow Chemical Company
Texas Division
Freeport, Texas 77541

EPA PROJECT OFFICER:

Dr. Thomas Short
R. S. Kerr Environmental
Research Laboratory
P. O. Box 1198
Ada, Oklahoma 74820

Project Site: Freeport, Texas

DESCRIPTION OF PROJECT

Award Date: January 1972

Project Cost: $226,574

Completion Date: July 1974

Federal Cost: $142,250

Summary:

Covers the installation and operation of control systems on an existing activated sludge pilot plant. These control devices will allow for monitoring and assessing the nature and amount of the biological process variation, and by "feedback" and "feedforward" responses, will compensate for these variations so as to maintain a high rate of removal. The results will be employed to develop a conceptual design of a waste treatment facility for alkaline, saline and organic-laden wastes generated from a manufacturing process producing polyhydric compounds.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 800773

TITLE OF PROJECT: Development of Treatment and Control Technology for Refractory Petrochemical Wastes

GRANTEE OR CONTRACTOR:

State of Louisiana
Louisiana State Science Foundation
Baton Rouge, Louisiana 70804

EPA PROJECT OFFICER:

Mr. Frank Mayhue
R. S. Kerr Environmental
Research Laboratory
P. O. Box 1198
Ada, Oklahoma 74820

Project Site: Baton Rouge, Louisiana

DESCRIPTION OF PROJECT

Award Date: February 1972

Project Cost: $1,100,205

Completion Date: February 1976

Federal Cost: $ 663,750

Summary:

The objectives of this R&D Program are: 1) To develop and demonstrate waste treatment procedures for the reduction of refractory petrochemical waste, equivalent to or exceeding that level of treatment attainable by biological treatment processes. Emphasis will be placed on the reduction of waste constituents affecting potable water supplies, aquatic and marine life with respect to taste and odor. The process to be investigated (individually or in combination) will include biological oxidation, solvent extraction, adsorption, and ozonization. 2)Development of an economical source of activated carbon from a waste petroleum based carbon by-product stream. 3)A quantitative definition as to which refractory compounds pose hazards in the lower Mississippi in current and projected concentrations, and the effect of industrial growth on stream quality. To meet the objectives of this proposal, nine major tasks are identifiable: 1) Waste characterization: priority ranking of plant streams, and evaluation of pollution significance; 2) Preliminary process feasibility studies; 3) Carbon preparation, activation, and regeneration procedures; 4) Pilot plant trials; 5) Analytical services; 6) Analysis of present and projected loadings, treatment levels, and treatment costs; 7) Supporting studies: 8) Evaluation of results and recommendations: and 9) Participating companies.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 800857

TITLE OF PROJECT: State-of-the-Art for the Inorganic Chemicals Industry: Industrial Inorganic Gases, Inorganic Pesticides, Commercial Explosives.

GRANTEE OR CONTRACTOR:

Illinois Institute of Technology
Dept. of Env. Engineering
Chicago, Illinois 60616

EPA PROJECT OFFICER:

Mr. Elwood E. Martin
Environmental Protection Agency
Washington, D. C. 20460

Project Site: Chicago, Illinois

DESCRIPTION OF PROJECT

Award Date: June 1972

Completion Date: July 1974

Project Cost: $30,972

Federal Cost: $28,695

Summary:

The project will identify types and classes of pollutants present in the organic chemical industry wastewaters; define "normal" ranges of raw waste loads associated with industry production; identify wastewater treatment processes available to the inorganic chemicals industry, and evaluate the effectiveness and cost of these processes relative to significant pollutants; and from these data, establish practical and achievable wastewater effluent guidelines applicable to the inorganic chemical industry. The study will yield a condensed, handbook-type compilation of available information on inorganic chemicals industrial wastewater composition, treatment technology, treatment effectiveness and costs.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 800947

TITLE OF PROJECT: Extraction or Destruction of Chemical Pollutants from Industrial Wastewater Streams

GRANTEE OR CONTRACTOR:

Texas A&M Research Foundation
P.A. Faculty Exchange H
College Station, Texas 77843

EPA PROJECT OFFICER:

Mr. Frank Mayhue
R. S. Kerr Environmental
Research Laboratory
P. O. Box 1198
Ada, Oklahoma 74820

Project Site: College Station, Texas

DESCRIPTION OF PROJECT

Award Date: March 1972

Completion Date: July 1974

Project Cost: $38,531

Federal Cost: $34,923

Summary:

The Texas A&M Research Foundation proposes to investigate, recommend methods and procedures, and make preliminary designs for advanced waste treatment processes for the reduction of contaminates in petrochemical plant waste effluent streams, equivalent to or exceeding second stage biological treatment processes. The waste products to be reduced will include halogenated hydrocarbons and other refractory compounds which effect potable water supplies, aquatic and marine life in the lower Miss. River with respect to taste, tainting, and odor. The primary objectives of this project are: 1) To accomplish the necessary bench work to quantitatively evaluate how selected petrochemical waste streams can be treated economically by solvent extraction and ozone oxidation; 2) To obtain distribution, performance, and other data necessary for preliminary design of in-plant continuous flow pilot plants for both solvent extraction and solvent recovery systems; 3) To construct & operate a continuous flow bench-scale pilot plant to determine performance and design data on how waste streams can be treated economically by ozone oxidation; 4) To make preliminary designs of continuous flow in-plant pilot plants for the previous processes; and 5) To determine and recommend the most suitable types of equipment for the previous processes and prepare cost estimates and economics for the full-scale industrial process units.

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 801030

TITLE OF PROJECT: Extraction of Chemical Pollutants from Aqueous Industrial Streams with Volatile Solvents

GRANTEE OR CONTRACTOR:

University of California
Chemical Engineering Dept.
Berkeley, California 94720

EPA PROJECT OFFICER:

Mr. Jack Hale
R. S. Kerr Environmental
Research Laboratory
P. O. Box 1198
Ada, Oklahoma 74820

Project Site: Berkeley, California

DESCRIPTION OF PROJECT

Award Date: June 1972

Project Cost: $124,424

Completion Date: May 1975

Federal Cost: $116,125

Summary: - To obtain experimentally fundamental physico-chemical data on the distribution of various pertinent chemical solutes (alcohols, phenols, aldehydes, ketones, etc.) between water and candidate volatile solvents, as a function of temperature, pressure and solute concentration. The solvents include carbon dioxide, isobutylene and propane. - To establish a correlation for distribution coefficients. - To construct and operate bench-scale, continuous-flow demonstration units (mini-plants) for quantitative evaluation of the extraction process as applied to waste-stream samples from petroleum-refining and petrochemical plants. - To obtain experimentally fundamental physical data (interfacial tensions, diffusivities, mass transfer rates, etc.) and operating data required for scale-up of an efficient extraction process. - To demonstrate the workability of extraction with volatile solvents as a method for treating typical concentrated petroleum and petrochemical wastewaters on a sustained basis. - To determine the most suitable type of extraction contactor and to measure and correlate its extraction efficiency. - To evaluate critically performance data from the demonstration unit toward an economic optimization of design variables. - To make a preliminary design of a full-scale industrial extraction process and to prepare cost estimates. - To establish, on the basis of engineering studies, the classes of industrial wastewaters which can be treated economically by extraction with volatile solvents.

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 801159

TITLE OF PROJECT: Characterization of Wastewaters from the Pharmaceutical Industry

GRANTEE OR CONTRACTOR:

Pharmaceutical Manufacturers' Assoc.
1155-15th Street, N.W.
Washington, D. C.

EPA PROJECT OFFICER:

Dr. Herbert S. Skovronek
Edison Water Quality Research
Laboratory
Edison, New Jersey 08817

Project Site: New Orleans, Louisiana

DESCRIPTION OF PROJECT

Award Date: August 1972

Project Cost: $39,927

Completion Date: June 1973

Federal Cost: $33,938

Summary:

The objectives of this project are to collect, summarize and validate the data necessary to define the sources and character of the industry's wastewaters, current treatment practices and their effectiveness. In addition, an attempt to identify areas where treatment technology is lacking and research is needed will be undertaken.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 801349

TITLE OF PROJECT: The Reclamation of Sulfuric Acid from Waste Streams

GRANTEE OR CONTRACTOR:
The New Jersey Zinc Co.
Palmerton, Pennsylvania 18071

EPA PROJECT OFFICER:
Dr. Herbert S. Skovronek
Edison Water Quality Research Laboratory
Edison, New Jersey 08817

Project Site: Palmerton, Pennsylvania

DESCRIPTION OF PROJECT

Award Date: February 1972

Completion Date: March 1974

Project Cost: $372,031

Federal Cost: $164,560

Summary:

The New Jersey Zinc Company will carry out a pilot plant study of a new approach to the recovery of sulfuric acid from the waste acid stream (20% H_2SO_4) generated during production of titanium dioxide pigment by the sulfate process. Specifically, the study will evaluate total evaporation of the waste acid stream and subsequent reconcentration, in two stages, of the clean acid back to the 90-95% concentration necessary for reuse in the digestion process. Simplified isolation of the dissolved sulfate salts by vapor-solid rather than liquid-solid separation will be an added advantage of the total evaporation approach. - The technical and economic applicability of the total evaporation approach to spent pickle liquor from steel mills will also be evaluated. - Based on results of the pilot plant study, a full scale plant will be designed and an economic evaluation carried out for treatment of waste acid from the sulfate process.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 801398

TITLE OF PROJECT: Treatment of Petrochemical Wastewater for Reuse

GRANTEE OR CONTRACTOR:
Union Carbide Corporation
270 Park Avenue
New York, New York 10017

EPA PROJECT OFFICER:
Mr. Leon Myers
R. S. Kerr Environmental
Research Laboratory
P. O. Box 1198
Ada, Oklahoma 74820

Project Site: Charleston, West Virginia/
Ponce, Puerto Rico

DESCRIPTION OF PROJECT

Award Date: June 1973

Completion Date: June 1975

Project Cost: $498,755

Federal Cost: $231,773

Summary: 1. To develop feasibility, design and economic data on petrochemical wastewater upgrading and subsequent reuse by testing a pilot-scale system comprising an integrated sequence of the most promising treatment steps for upgrading bio-treated petrochemical effluents for use in pilot-scale heat transfer systems. Processes comprising the treatment pilot-plant will be selected after an initial technology review, followed by bench-scale tests to develop design and feasibility data, where necessary. Need for facilities for the disposal of sludges and other by-product wastes will be considered in this study. Processes to remove the following categories of residual contaminants will be included - suspended solids, soluble organics, and soluble salts. 2. To compile present quality criteria for cooling water, boiler-feed water, service water, and process water in typical petrochemical plants and to determine the effects of using lower quality water, particularly with respect to residual organic contamination. 3. To evaluate alternative or additional operations/processes, concurrently, for incorporation in the pilot treatment system if a need for such alternatives is indicated by pilot-scale operating experience or by more precise definition of quality criteria for reclaimed water. 4. To compare the economic and technical feasibility of alternative processes to aid in proper selection and to develop thorough economics for an integrated treatment system capable of producing reuseable water. 5. To refine analytical techniques for monitoring removals achieved by the various treatment processes to permit a more precise evaluation of the processes' effectiveness and to identify ways to improve them.

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 801431

TITLE OF PROJECT: Naval Stores - Wastewater Purification and Reuse by Activated Carbon Treatment

GRANTEE OR CONTRACTOR:

Hercules, Incorporated
Wilmington, Delaware 19899

EPA PROJECT OFFICER:

Dr. Herbert S. Skovronek
Edison Water Quality Research Laboratory
Edison, New Jersey 08817

Project Site: Hattiesburg, Mississippi

DESCRIPTION OF PROJECT

Award Date: April 1973

Project Cost: $1,672,570

Completion Date: March 1974

Federal Cost: $ 132,885

Summary:

Hercules plans to install and operate an activated carbon treatment system to handle the 3.2 mgd of wastewater generated by the manufacture of wood chemicals from pine stumps and other chemicals from other raw materials. The project will establish the economics, effectiveness, and efficiency of this advanced waste treatment technique for such wastes high in organic contaminants and suspended solids. Extensive reuse of treated wastewater within the plant is planned as part of the study if pilot plant results are confirmed.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 801577

TITLE OF PROJECT: Pollution Control Technology for Pesticide Formulators and Packagers

GRANTEE OR CONTRACTOR:

National Agricultural Chemical Assoc.
1155 15th Street N.W.
Washington, D. C. 20005

EPA PROJECT OFFICER:

Mr. David L. Becker
Environmental Protection Agency
Office of Water Programs
Washington, D. C.

Project Site: Kansas City, Mo./Washington, D.C.

DESCRIPTION OF PROJECT

Award Date: September 1972

Project Cost: $40,000

Completion Date: August 1974

Federal Cost: $38,000

Summary:

The objectives of the proposed project are to: 1) Characterize the pesticide formulation and packaging industry for production and pollution purposes; 2) Characterize the industry wastewaters - raw waste loads and other unique problems; 3) Identify or define and assess the best practicable treatment technology in terms of operating characteristics and cost; 4) Identify or define and assess the best available treatment technology in terms of operating characteristics and cost; 5) Identify or define and assess pretreatment technology for discharge to municipal systems, in terms of operating characteristics and cost where applicable; 6) Identify the R&D needed to achieve a "closed loop" wastewater control system or the elimination of pollutional discharges.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 802684

TITLE OF PROJECT: Integrated Slime and Fluorine Control - Phosphate Manufacturing Industry

GRANTEE OR CONTRACTOR:

Florida Dept. of Air and
Water Pollution Control
Tallahassee Bank Building
Tallahassee, Florida 32301

EPA PROJECT OFFICER:

Mr. Edward Lomasney
EPA, Region IV
1421 Peachtree Street, NE
Atlanta, Georgia 30309

Project Site: Decatur, Georgia

DESCRIPTION OF PROJECT

Award Date: July 1973 (revised)

Project Cost: $1,979,340

Completion Date: June 1977

Federal Cost: $506,709

Summary:

Pilot scale demonstration of an integrated vapor emission control and closed cycle wastewater system with fluorine recovery in forms other than fluorosilicic acid; pilot-scale demonstration/evaluation of wet-process phosphoric acid digestion modifications to eliminate vapor fluorine emission while producing an insoluble fluoride product suitable for concentration via selective flotation and ultimate recovery as useful products (flotation technology feasibility to be investigated at bench scale); development and demonstration at bench scale of wet-process modifications which will eliminate the need for wet benefication of phosphate rock and therefore eliminate phosphate slime production. Implications/impact of dry mining/matrix process adoption on fluorine control and recovery technology as developed in other phases of this project will also be delineated as will potential for utilization of existing aged-slimes as phosphate source.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 802753

TITLE OF PROJECT: Renovation of Industrial Wastewater by Evaporation With Interface Enhancement

GRANTEE OR CONTRACTOR:
University of California
Berkeley, California

EPA PROJECT OFFICER:
Mr. Richard B. Tabakin
Edison Water Quality Research Laboratory
Edison, New Jersey 08817

Project Site: Berkeley, California

DESCRIPTION OF PROJECT

Award Date: June 1973

Completion Date: November 1974

Project Cost: $29,615

Federal Cost: $25,000

Summary:

The objective of this project is to evaluate the increased heat transfer and other advantages which can be achieved with the use of a small amount of surfactant in the treatment of wastewaters by upflow vertical tube evaporation. The study will involve the testing of typical inorganic wastewaters in a 5,000 gpd vertical tube evaporator.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 802872

TITLE OF PROJECT: State-of-the-Art of the Military Explosives and Propellants Industry

GRANTEE OR CONTRACTOR:
American Defense Preparedness Assoc.
Union Trust Building, Suite 819
740-15th Street
Washington, D. C.

EPA PROJECT OFFICER:
Mr. Richard B. Tabakin
Edison Water Quality Research Laboratory
Edison, New Jersey 08817

Project Site: Washington, D. C.

DESCRIPTION OF PROJECT

Award Date: November 1973

Project Cost: $42,776

Completion Date: February 1975

Federal Cost: $40,500

Summary:

The objective of this project is to define and characterize typical wastewater effluents and treatment technology at GO-GO and GO-CO explosives and propellants production and LAP plants.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 802908

TITLE OF PROJECT: Treatment of Ammonia Plant Process Condensate Effluents

GRANTEE OR CONTRACTOR:

Louisiana Chemical Association
Taylor Building, Room 300
251 Florida Street
Baton Rouge, Louisiana 70801

Project Site: Donaldsonville, La.

EPA PROJECT OFFICER:

Dr. Robert R. Swank
Southeast Environmental
Research Laboratory
College Station Road
Athens, Georgia 30601

DESCRIPTION OF PROJECT

Award Date: July 1974

Project Cost: $258,320

Completion Date: December 1976

Federal Cost: $124,000

Summary: Objectives - To establish technology to remove the ammonia organics and carbon dioxide trace contaminants in the process condensate effluent from large ammonia plants. In looking toward the future effluent requirements, this program will establish the technology for total process effluent recycle.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 803026

TITLE OF PROJECT: Final Purification of Aerated Lagoon Effluent by Chemical Coagulation - Mixed Media Filtration

GRANTEE OR CONTRACTOR:

American Oil Company
910 S. Michigan Avenue
Chicago, Illinois 60680

Project Site: Yorktown, Virginia

EPA PROJECT OFFICER:

Mr. Leon Myers
R. S. Kerr Environmental
Research Laboratory
P. O. Box 1198
Ada, Oklahoma 74820

DESCRIPTION OF PROJECT

Award Date: July 1971

Project Cost: $257,179

Completion Date: April 1974

Federal Cost: $ 95,815

Summary:

The project is for the full-scale (1.5 mgd) treatment of the petroleum refinery's aerated lagoon effluent. The chemical coagulation mixed media filter system will perform as a polishing facility for final clarification and purification to produce a consistent water quality effluent with the normal expectations of tertiary treatment.

The work encompasses six major efforts summarized as: 1) Design and construction; 2) Process demonstration; 3) Determination of process efficiency and phase separation costs; 4) Economic comparison with air flotation; 5) Establishment of process reliability; and 6) Determination of capital and operating costs for full-scale treatment.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 803085

TITLE OF PROJECT: Development of Total Recycle Systems for Petrochemical Waste Brines Containing Refractory Contaminants

GRANTEE OR CONTRACTOR:

The Dow Chemical Company
Texas Division
Contracts Research Laboratory
Freeport, Texas 75541

Project Site: Freeport, Texas

EPA PROJECT OFFICER:

Dr. Thomas Short
R. S. Kerr Environmental
Research Laboratory
P. O. Box 1198
Ada, Oklahoma 74820

DESCRIPTION OF PROJECT

Award Date: July 1974

Completion Date: July 1975

Project Cost: $181,179

Federal Cost: $110,028

Summary:

A system which utilizes a reverse osmosis-electrodialysis dissolved solids removal process will be developed for application to petrochemical wastes. Ammonia strippers, chemical oxidation, carbon adsorption, macroreticular resin adsorption, and ion exchange will also be evaluated for removal of contaminants from the waste stream.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 803159

TITLE OF PROJECT: Chlorinated Hydrocarbon Pesticide Removal from Wastewater

GRANTEE OR CONTRACTOR:

Velsicol Chemical Corporation
1199 Warford Street
P. O. Box 8127
Memphis, Tn. 38108

Project Site: Memphis, Tn.

EPA PROJECT OFFICER:

Dr. Robert R. Swank
Southeast Environmental
Research Laboratory
College Station Road
Athens, Georgia 30601

DESCRIPTION OF PROJECT

Award Date: May 1974

Completion Date: May 1976

Project Cost: $299,971

Federal Cost: $221,800

Summary:

Two processes for chlorocarbon pesticide wastewater are to be developed, demonstrated, and evaluated in parallel through miniworks scale. The demonstration test will involve the heptachlor-endrin wastewater effluent from Velsicol's Memphis, Tennessee plant. The processes of choice are resin adsorption removal and in situ metal-bimetal catalytic reduction (dechlorination).

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 803231

TITLE OF PROJECT: Refractory Indices for Organic Industrial Wastes

GRANTEE OR CONTRACTOR:

University of Connecticut
Civil Engineering Department
Storrs, Connecticut

EPA PROJECT OFFICER:

Mr. Billy L. DePrater
Robert S. Kerr Environmental
Research Laboratory
P. O. Box 1198
Ada, Oklahoma 74820

Project Site: Storrs, Connecticut

DESCRIPTION OF PROJECT

Award Date: July 1974

Completion Date: July 1976

Project Cost: $56,188

Federal Cost: $18,000

Summary:

A study of the oxygen demand parameters of wastewater and the use of selected parameters to develop Refractory Indices. The Refractory Indices will help determine whether biological treatment or other methods of treatment are necessary for a wastewater.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 803286

TITLE OF PROJECT: Demonstration of Evaporator-Incinerator for Concentrated Pharmaceutical Wastes

GRANTEE OR CONTRACTOR:

Pfizer Pharmaceuticals, Inc.
P. O. Box 628
Barceloneta, Puerto Rico 00617

EPA PROJECT OFFICER:

Dr. Herbert S. Skovronek
Edison Water Quality
Research Laboratory
Edison, New Jersey 08817

Project Site: Barceloneta, Puerto Rico

DESCRIPTION OF PROJECT

Award Date: July 1974

Project Cost: $181,895

Completion Date: May 1975

Federal Cost: $ 70,000

Summary:

A treatment facility for control of wastewaters from batch manufacturing operations which are relatively high in organics and dissolved salts will be constructed and operated. The process sequence selected includes evaporation and incineration of organics, thermal degradation of weak acid salts, and crystallization and fluid bed drying of ionic salts. Waste heat will be recovered and reused within the system. Products should be water vapor, dry salts, and aqueous sodium carbonate from scrubbers.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 803357

TITLE OF PROJECT: State-of-the-Art Study on Ozone for Industrial Water and Wastewater Treatment

GRANTEE OR CONTRACTOR:

International Ozone Institute, Inc.
24 Central Avenue
Waterbury, Connecticut 06702

EPA PROJECT OFFICER:

Mr. L. Frank Mayhue
R. S. Kerr Environmental
Research Laboratory
P. O. Box 1198
Ada, Oklahoma 74820

Project Site: Waterbury, Connecticut

DESCRIPTION OF PROJECT

Award Date: August 1974

Project Cost: $15,002

Completion Date: July 1975

Federal Cost: $ 8,000

Summary:

Study will attempt to combine, in one report, all ozone technology references with respect to industrial wastewater treatment. Field of search will include such areas as Europe, Canada, Japan, etc.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 803358

TITLE OF PROJECT: Closed-Loop Recycle System for Waste Acid Pickle Liquor

GRANTEE OR CONTRACTOR:

Crown Chemical Company, Inc.
515 South Harmon Street
Indianapolis, Indiana 46225

EPA PROJECT OFFICER:

Mr. Richard B. Tabakin
Edison Water Quality
Research Laboratory
Edison, New Jersey 08817

Project Site: Alton, Illinois

DESCRIPTION OF PROJECT

Award Date: July 1974

Completion Date: July 1976

Project Cost: $1,316,180

Federal Cost: $65,000

Summary:

A method for conversion of ferrous sulfate from spent pickle liquor to iron oxide and reuseable sulfuric acid will be evaluated. A ferric nitrate intermediate, produced by continuous ion exchange, will be decomposed to produce the oxide and nitric acid for recycle. A full scale system will then be installed in a steel mill so that the total closed-loop system can be studied.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

FINAL REPORTS AVAILABLE

CHEMICALS AND ALLIED PRODUCTS, AND PETROLEUM REFINING

Report Number	Title/Author	Source
12020 02/70	Petrochemical Effluents Treatment Practices - Summary, Engineering-Sciences, Incorporated/Texas, Austin, Texas.	NTIS ($3.00) PB 192 310
12020 DIS 01/72	Anaerobic Treatment of Synthetic Organic Wastes, Union Carbide Corporation, South Charleston, West Virginia.	GPO $1.75 NTIS PB 211 130
12020 DJI 06/71	Wastewater Treatment Facilities for a Polyvinyl Chloride Production Plant, B. F. Goodrich Chemical Company, Cleveland, Ohio.	GPO $1.00 NTIS - PB 211 464
12020 DQC 03/71	Polymeric Materials for Treatment and Recovery of Petrochemical Waste, Gulf South Research Institute, New Orleans, LA.	GPO $0.70 NTIS - PB 201 699
12020 EEQ 10/71	Treatment of Wastewater from the Production of Polyhydric Organics, Dow Chemical Company, Texas Division, Freeport, Texas	GPO $1.75
12020 EID 03/71	Preliminary Investigational Requirements - Petrochemical and Refinery Waste,Treatment Engineering-Science, Incorporated, Austin, Texas.	GPO $1.50 NTIS - PB 212 369
12020 EJI 07/71	Inorganic Chemicals Industry Profile, Datagrpahics, Incorporated, Pittsburgh, Pennsylvania	GPO $1.75 NTIS - PB 206 308
12020 EXG 03/72	Effect of Chlorination on Selected Organic Chemicals, Manufacturing Chemists Association, Washington, D. C.	GPO $1.00 NTIS - PB 211 160
12020 FPD 09/71	Inorganic Fertilizer and Phosphate Mining Industries - Water Pollution and Control, Battelle Memorial Institute, Richland, Washington.	GPO $1.75 NTIS - PB 206 154
12020 FYE 01/72	Pesticide Manufacturing Industry - Current Waste Treatment and Disposal Practices, University of Austin, Texas.	GPO $1.00 NTIS - PB 211 129

Report Number	Title/Author	Source
12020 GND 07/71	Projected Wastewater Treatment Costs in the Organic Chemicals Industry, Datagraphics, Incorporated, Pittsburgh, Pennsylvania.	GPO - $1.50
EPA-R2-73-194	Identification and Control of Petrochemical Pollutants Inhibitory to Anerobic Processes, Union Carbide Corporation, South Charleston, West Virginia.	GPO
EPA-600/2-74-006	Study of Feasibility of Herbicide Orange Chlorinolysis, Diamond Shamrock Corp., Painesville, Ohio.	GPO
EPA-670/2-74-044	An Ion-Exchange Process for Recovery of Chromate from Pigment Manufacturing, Mineral Pigments Corp., Beltsville, Maryland.	GPO
EPA-670/2-74-030	Waterborne Wastes of the Paint and Inorganic Pigments Industries, Southern Research Institute, Birmingham, Alabama.	NTIS
EPA-670/2-74-057	Characterization of Wastewaters from the Ethical Pharmaceutical Industry, Pharmaceutical Manufacturers Association, Washington, D. C.	GPO
EPA-R2-73-200	Recondition and Reuse of Organically Contaminated Waste Sodium Chloride Brines, Dow Chemical U.S.A., Midland, Michigan.	GPO
EPA-12050 DRC 11/71	Experimental Evaluation of Fibrous Bed Coalescers for Separating Oil-Water Emulsions, Illinois Institute of Technology, Department of Chemical Engineering, Chicago, Illinois.	GPO - $1.75 NTIS - PB 210 144
EPA-12050 DSH 03/71	Impact of Oily Materials on Activated Sludge Systems, Hydroscience, Incorporated, Westwood, New Jersey.	GPO - $1.50 NTIS - PB 212 422
EPA 12050 EKT 03/71	Fluid Bed Incineration of Petroleum Refinery Wastes, American Oil Company, Mandan, North Dakota.	GPO - $1.50 NTIS - PB 202 570

Report Number	Title/Author	Source
EPA-R2-72-001	Evaluation of Waste Waters from Petroleum and Coal Processing, Oklahoma University, Norman, Oklahoma	GPO
EPA-R2-72-110	Oily Waste Disposal by Soil Cultivation Process, Shell Oil Company, Deer Park, Texas	GPO

FOOD AND KINDRED PRODUCTS

Activities under this subprogram element encompass those industries dealing with the processing of products for ultimate human or animal consumption. It is estimated that the wastes generated by this industry, comprising some 32,000 related companies, represent 21% of the total national manufacturing pollutional load. The industry has been broken down into sub-categories along the guidelines of the Standard Industrial Classification (SIC) Manual. These encompassed categories include: (1) Meat Products; (2) Dairy Products; (3) Canned and Frozen Foods; (4) Grain Mill Products; (5) Bakery Products; (6) Sugar; (7) Beverage Industries; (8) Candy and Related Products; (9) Miscellaneous Foods; and (10) Leather Tanning.

The diversity of processing operation, volume, and the seasonal nature of this grouping causes extreme variation in BOD_5, COD, suspended and dissolved solids, pH, etc., in the resultant organic waste streams. The program's goal is to assist the various sub-industries in the development of design, operational, and economic technology to create novel or improved pollution abatement systems. This program mission, of a closed-loop industrial system, will be met by the proper combination of in-plant water conservation, pretreatment, and chemical, physical, and biological wastewater management systems. This would ultimately result in the total process water reuse and in-plant recovery of valuable products (or by-products).

The R&D Program for the food industry initiates research efforts under the grant, contract, and in-house provisions of PL 92-500, Section 104 and 105. The objectives are met through a R&D planning function located at EPA Headquarters, Washington, D. C., and an implementation program located at the Pacific Northwest Water Laboratory in Corvallis, Oregon.

MEAT PRODUCTS AND RENDERING INDUSTRY

This research area encompasses three food processing industries with over 5,000 plants and a raw wastewater flow in excess of 80 billion gallons per year with a BOD_5 load of over 700 million pounds per year.

There are three SIC involved, these are: 2011 (Meat Packing Plants), 2013 (Sausages and Other Prepared Meats), 2015 (Poultry Dressing Plants). Between 50% and 70% of the discharges are to municipal sewer systems.

Red meats and poultry processing both include: receiving facilites; killing; removal of the hide, hair, or feathers; eviscerating and trimming; cooling; and packing. Further processing of the meat is more extensive with swine and beef than poultry. By-product operations include blood drying; hide, hair, or feather processing; viscera handling; and rendering.

The waste loads in lbs per 1000 lbs of live weight killed are similar for packinghouse and broiler processors; average values are shown in the table below.

WASTE LOAD PARAMETER	BROILERS	PACKINGHOUSE
BOD_5	10	12.1
SS	7.8	8.7
Grease	1.7	6.0
TKN	1.2	1.0
P	0.4	0.2
Flow (Gallons)	2200	1050

In terms of reducing waste the extreme variation in waste loads found between plants is more significant than the average values above.

The large volume of wastewater produced contains vast quantities of organic process residues. Most of the primary and secondary process waste streams should be separately handled to recover valuable material and/or reduce costs in the treatment system. Treatment systems in the meat packing industry consist of primary units for liquid-solids separation followed by secondary biological treatment systems to reduce the BOD and suspended solids.

DAIRY PRODUCTS PROCESSING

Approximately 51 billion kilograms of milk are processed by 5350 plants into: creamery butter (SIC 2021); cheese (natural and processed) (SIC 2022); condensed and evaporated milk (SIC 2023); ice cream and frozen desserts (SIC 2024); and fluid milk (SIC 2026).

It is estimated, on an annual basis, that of the 56 billion gallons of total water intake by this industry, 53 billion gallons are discharged as waste with 31 billion gallons going to municipal sewers and 20 billion gallons to surface waters. The total wastewater from this industry contains about 400 million pounds of BOD and 200 million pounds of suspended solids.

Another 22 billion gallons of water are recycled in this industry with fluid milk accounting for about 12 billion gallons. Fluid milk also discharges 27 billion gallons of waste annually which is 51% of that discharged by the total industry.

Fluid milk processing steps consist of receiving, storage, standardization pasteurization, homogenization, deodorization, and packaging. For cultured products the process consists of receiving, storage, separation, pasteurization culturing, packaging. Processing is similar through the pasteurization step for natural and processed cheese, then following the manufacturing step the cheese is pressed into hoops, dried, cured, and packaged.

Unit operations similar to the above are generally used throughout the rest of the industry. Subcategories of the dairy industry and average waste loads are given below:

	VOLUME GAL/10^3 lb M. E.	Kg BOD PER 1,000 kg M. E.
Receiving Station: Cans	100	0.5
Receiving Station: Bulk	65	0.3
Fluid Products	465	1.5
Cultured Products	465	2.0
Butter	100	0.8
Natural and Processed Cheese	925	0.7
Cottage Cheese	100	8.0
Ice Cream	500	3.0
Condensed Milk	475	1.0
Dry Milk	225	1.5
Condensed Whey	125	0.4
Dry Whey	125	0.6

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*M. E. = Milk equivalent received

Properly designed and operated biological treatment systems can reduce waste loads in the range of 90% to over 98% with the exception of cheese whey treatment. This presents an additional problem due to the 10 billion kilograms of whey generated annually, and about 40% of this quantity is discharged as waste. EPA demonstration grants have partially addressed this problem in the form of projects involving fermentation, drying, enzymatic conversion, and regional whey collection to produce useable by-products in lieu of the wastewater treatment approach.

Projected long term improvements in wastewater technology for the dairy products industry lie in the areas of conversion of waste whey into useful by-products, in-plant water conservation, recovery of in-process by-products such as solids from cottage cheese rinse waters, improved biological treatment processes and additional solids removal methods.

CANNED AND PRESERVED FRUITS AND VEGETABLES INDUSTRY

This industrial category is composed of the following 1972 Standard Industrial Classifications (SIC) codes: SIC 2032 (Canned Specialties); SIC 2033 (Canned Fruits, Vegetables, Preserves, Jams, and Jellies); SIC 2034 (Dried and Dehydrated Fruits, Vegetables, and Soup Mixes); SIC 2035 (Pickled Fruits, Vegetable Sauces, Seasonings, and Salad Dressings); SIC 2037 (Frozen Fruits, Fruit Juices, and Vegetables); SIC 2099 (Food Preparation not elsewhere classified (scope limited to establishments processing potato, corn, and other chips and pectin)).

Basically the canned and preserved fruits and vegetables industry extends the shelf life of raw commodities through the use of various preservation methods. The most common methods being canning, freezing, dehydrating, and brining. Preserving of fruits and vegetables in general include the following unit operations: clean, sort, peel, size, stabilize, and process. Many specialty products initiate processing with preprocessed foods.

This industry category is of high economic stature in that it employs some 250,000 individuals, consists of some 3,000 processing facilities, and adds some $2 billion to the value of the raw product.

Water use varies from less than 500 gallons per ton (pineapple and sauerkraut) to over 13,000 gallons per ton (asperagus). BOD_5 loads (lbs per ton of raw product processed) range from 4 (apple juice) to 100 (sweet potato and red beets); SS vary from less than one to over 50 pounds per ton. This category is a significant industrial waste discharger of BOD_5 and SS.

In general, the wastes are biologically degradable with some exceptions such as, olive storage and processing brines, cherry brines, and sauerkraut brines. Limitation in design and operational problems may result from length of processing seasons, variability in processing, and lack of inorganic nutrients. Waste treatment and control range from no treatment to extensive in-plant control with by-product recovery, and complete land retention of all liquid wastes (no discharge to surface waters).

CANNED AND PRESERVED SEAFOOD INDUSTRY

The fish and seafoods processing industry can be classified into the following subcategories: farm raised catfish, conventional blue crab, mechanized blue crab, Alaskan crab meat, Alaska whole crab and crab sections, Dungeness and Tanner crab in the contiguous states, Alaskan shrimp, Northern shrimp in the contiguous states, Southern nonbreaded shrimp in the contiguous states, breaded shrimp in the contiguous states, tuna, and other aquatic and marine species.

There are about 950 seafood processors. There is great variability in length of processing season and day to day amounts of material processed. The total season may be as short as six weeks (salmon) with 50% of the production occurring in a two week period.

Available information on water use and wastewater characteristics was extremely meager until recently. Examples of unit waste loads for some species of seafoods processing are shown in the following table:

	Water Use gpt	BOD lbs/ton	SS lbs/ton
Farm Raised Catfish	5500	15.8	18.4
Conventional Blue Crab	280	10.4	1.5
Mechanized Blue Crab	8800	44.0	24.0
Alaskan Crab Meat	7800	17.8	11.2
Alaskan Whole Crab and Crab Sections	4000	12.2	7.0
Dungeness and Tanner Crab in the Contiguous States	4600	16.2	5.4
Alaskan Shrimp	25000	230	380
Northern Shrimp in the Contiguous States	14400	240	108
Southern Nonbreaded Shrimp in the Contiguous States	11300	92	76
Breaded Shrimp in the Contiguous States	28000	168	185
Tuna	4400	26	20

As shown, there is tremendous variability in both the amount of water used as well as in the BOD and SS loads generated.

Treatment of wastewaters from seafood processing is almost nonexistent. The tuna processing industry has done considerable work on by-product recovery. Some of the other segments also screen their wastes for recovery of solids for use in meal and feeds. A considerable amount of work is needed on in-plant water use as well as end-of-the-pipe treatment.

In general, the use of biological treatment systems will be limited unless they are long detention time processes because of the length of processing and the day to day variability. The most promising approaches compatible with the economics of the industry appear to be chemical/physical systems such as screening, sedimentation, flotation (with or without chemical additives), additional by-product recovery, and in-process changes such as a low water use shrimp peeler.

Consideration should be given to the collection of solid wastes from seafood processors and the transformation of this waste into a useful product such as animal feed at a central facility.

GRAIN MILLS

The grain mill products industry is comprised of six categories in the 1972 census of manufacturers. These are: SIC 2041 (Flour and Other Grain Mill Products), SIC 2043 (Cereal Breakfast Foods), SIC 2044 (Rice Milling), SIC 2045 (Blended and Prepared Flour), SIC 2046 (Wet Corn Milling), SIC 2047 (Dog, Cat, and Other Pet Food), SIC 2048 (Prepared Feeds and Feed Ingredients for Animals and Fowls - not elsewhere classified. Approximately 3,000 production plants exist in this industry.

It is estimated, on an annual basis, that of the 75 billion gallons of total water intake by this industry 67 billion gallons are discharged as waste with 20 billion gallons going to municipal sewers and 47 billion gallons going to surface waters. Another 47 billion gallons of water are recycled in this industry with corn wet milling account for about 45 billion gallons. Corn wet milling also discharged 60 billion gallons of waste annually which is 90% of that discharged by the total industry.

Primary milling subcategories with their indicated raw waste loads are as follows:

	VOLUME GALS/MS BU*	BOD LBS/MS BU*	SS LBS/MS BU*
Corn Wet Milling	50	400	200
Corn Dry Milling	4	63	90
Normal Wheat Flour Milling	dry process		
Bulgur Wheat Flour Milling	2	6	6
Normal Rice Milling	dry process		
Parboiled Rice Milling	16**	0.18***	0.007***

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* 1,000 Standard Bushels of Grain Processed
** GAL/CWT
***LB/CWT

Involved unit operations included cleaning, tempering, drying, milling, sifting, and extraction.

Treatment technology for these subcategories consists of flow equilization, screening, primary clarification, biological treatment, secondary clarification, chemical flocculation and precipitation, flotation, and filtration effluent polishing.

Projected long term improvements in wastewater treatment technology lies in extended in-plant controls, improved biological treatment, and additional solids removal.

SUGAR PROCESSING

The 1972 Standard Industrial Classification (SIC) separates this industry into: SIC 2061 (Cane Sugar - except refining), SIC 2062 (Cane Sugar Refining), and SIC 2063 (Beet Sugar).

BOD_5, temperature and pH have been established as the significant effluent parameters.

The Sugar Processing Industry encompasses those operations that convert raw sugar cane to raw sugar, raw sugar to refined sugar (liquid or crystal), and raw sugar beets to refined sugar.

Approximately 350 production plants are involved in discharging in excess of 180 billion gallons of waste water annually to surface waters containing some 300 million lbs of BOD_5 and 2000 million lbs of suspended solids.

Beet Sugar Segment

Basically, processing of sugar beets into refined sugar consists of beet washing, slicing, extraction, purification, concentration, and crystallization. Specific processing steps are: (1) Harvest, delivery, and storage of raw beets; (2) Transporting, washing, weighing, and slicing of raw beets; (3) Sugar extraction from sliced beets (cossettes); (4) Carbonation-clarification of the raw juice (purification); (5) Juice concentration by evaporation; and (6) Sugar crystallization by evaporation followed by crystal separation (centrifugation).

Existing liquid waste treatment and control systems range from reuse and partial treatment of the transport - wash water system to extensive in-plant controls and reuse systems (transport plus condenser water) with complete land retention of both solid and liquid waste (no discharge to surface waters). In-plant process controls include reduction of entrainment in condenser water, recirculation of condenser water following cooling tower or ponds, and dry handling of filter mud.

Future EPA research and development studies will be directed toward developing technology for establishing total environmental control for this industrial segment. Specific areas that will be investigated are: (1) Evaluating significance of pending high strength organic wastes on ground water quality; (2) Developing and demonstrating a "dry" transport and cleaning system; and (3) Develop and demonstrate by-products from transport and lime muds. Many of the environmental control technologies developed for one segment of the sugar industry will have application to the other segments of the industry.

Cane Sugar Refining

Cane sugar refining takes raw cane sugar (final product from cane sugar milling) and processes it into either refined crystalline or liquid sugar. The primary difference between crystalline and liquid refineries is that liquid refineries do not recrystallize their primary product. In each of these types of refineries the film is then placed into solution and taken through various purification steps. After purification the two types of refineries differ. Crystalline refineries recrystallize the sugar and liquid refineries filter the purified sugar. Specific processing steps are:

CRYSTALLINE REFINERY	LIQUID REFINERY
Affirmation and Melting	Affirmation and Melting
Clarification (Defecation)	Clarification (Defecation)
Decolorization	Decolorization
Concentration (Evaporation)	Concentration (Evaporation)
Crystallization (Evaporation)	Filtration
Finishing	Inversion

Liquid wastewater treatment and disposal ranges from essentially no treatment to complete land retention with no discharge to surface waters. Barometric condenser water recycle system is being utilized by one refinery. However, the common practice is to discharge condenser water to surface waters after a once through use.

EPA research and development studies will be directed towards developing technology for establishing Total Environmental Control for sugar cane refineries. Specific areas to be investigated are: (1) Evaluating significance of ponding high strength organic wastes on ground water quality; (2) Develop and demonstrate low water use purification-decolorization procedures; and (3) Demonstrate barometric condenser recycle system with blowdown treated and reused as process water.

Cane sugar milling is a process where sugar is processed into raw cane sugar. The raw sugar is then sold to cane sugar refineries for processing into refined sugar. Manufacturing of raw sugar from cane involves the extraction of juice from sugar cane, purification, crystallization, and finally separation of the crystals from the juice. The specific processing steps are cane harvesting, cane washing, juice extraction, juice clarification, juice concentration (evaporation), crystallization, and separation (centrifugation).

Existing treatment and control systems range from essentially no treatment to extensive reuse with complete land retention of both solid and liquid wastes (no discharge to surface waters). In-plant process controls include reduction of entrainment in condenser water, recirculation of condenser water following cooling tower or ponds, dry handling of filter mud, and recirculation of cane wash water.

Present and future EPA research and development grants will be directed toward developing Total Environmental Control for this segment of the Sugar Processing Industry. Specific areas to be investigated are: (1) Develop and demonstrate cane wash recycle systems using raw juice as the washing medium (present grant); (2) By-product use of trash and bagasse for base load electrical supply (present study); (3) Develop and demonstrate barometric condenser recycle system with blowdown treated and reused as process water; (4) Develop and demonstrate additional by-products from trash and bagasse; and (5) Develop and demonstrate additional by-products from lime mud and wash mud.

MISCELLANEOUS FOODS AND BEVERAGES

This program area encompasses egg processing, six beverage industries, five edible oils industries and a catch-all classification of four dozen food preparation processes. Miscellaneous foods consists of four Standard Industrial Classifications (SIC), these are: SIC 2095 (Roasted Coffee); SIC 2097 (Manufactured Ice); SIC 2098 (Macaroni, Spaghetti, Vermacelli, and Noodles); and SIC 2099 (Food Preparation - not elsewhere classified).

The beverage industries include: SIC 2082 (Malt Beverages); SIC 2083 (Malt); SIC 2084 (Wines, Brandy, and Brandy Spirits); SIC 2085 (Distilled, Rectified, and Blended Liquors); SIC 2086 (Bottled and Canned Soft Drinks and Carbonated Waters); and SIC 2087 (Flavoring Extracts and Flavoring Syrups - not elsewhere classified). Edible Oils consist of SIC 2074 (Cottonseed Oil Mills), SIC 2075 (Soybean Oil Mills), SIC 2076 (Vegetable Oil Mills), SIC 2077 (Animal and Marine Fats and Oils), and SIC 2079 (Shortening and Cooking Oils). Egg processing is part of SIC 2017 (Poultry and Egg Processing).

Half of the plants in the beverage industry and the edible oil industry and three-fourths of the plants in miscellaneous foods have 20 or less employees. Thus, the majority of establishments in these industries are small operations. Most of the wastewater is discharged to municipal plants. The wastewater volumes from the beverage industry far exceed that from miscellaneous foods and edible oils.

RAW WASTEWATER LOAD BY INDUSTRY

Type Of Industry	Units of Input	Flow Gallons	BOD (lbs)	SS (lbs)
Malt Beverages	1000 Barrels	260,000	3000	1200
Malt Industry	1000 Bushels	42,000	240	41
Wine and Brandy	1000 Lbs Grapes	760	37	-
Distilled Liquor	1000 Bushels	31,000	180	180
Soft Drinks	1000 Cases	4,000	7.3	-
Potato Chips	1000 Lbs Potato	2,000	25	33
Yeast	1000 Lbs Molasses	2,600	46	-
Roast Coffee	1000 Lbs Beans	250	2	0.5
Edible Oils	1000 Doz. Eggs	60	0.2	-
Egg Processing	1000 Doz. Eggs	80	250	-

Malt Beverages

Processing comprises adding hot water to malt and cooked grain, followed by enzymatic action and then the spent grain is removed. Next hops are added and the mixture is boiled. Following cooling and clarification yeast is added and the mixture is fermented. After clarification the beer is carbonated and packaged.

Annual production of 150 million barrels of beer generated about 40 billion gallons of process wastewater containing about 450 million pounds of BOD and 180 million pounds of suspended solids per year.

Malt Industry

Manufacturing of malt from barley comprises three steps - steeping, germinating, and kilning. The purpose of malting is to initiate enzymatic reactions that modify the starch and protein in barley to produce fermentable sugars and other substances important in the brewing of beer and similar products. This segment of the beverage industry will use about 5 billion gallons of process water and 3 billion gallons of cooling water. The former will contain about 26 million pounds of BOD and 5 million pounds of suspended solids.

Wine and Brandy

Wine processing includes crushing of the grapes followed by primary fermentation (before or after removal of the solids), racking (removal of sediment), secondary fermentation, racking, aging, clarification and bottling. Brandy is produced by distilling wine and condensing the distillage to obtain a beverage of high alcoholic content. There are many variations in the above processing steps and, as a result, large variations in quantity and quality of wastewaters.

Distilled Liquor

Selected grain (corn, rye and/or malt) is milled, mashed, fermented, distilled, stored and bottled, with many variations to produce whiskey. The 40 million bushels of grain processed annually, generate about 1.3 billion gallons of process wastewater with over 7 million pounds of BOD.

Soft Drinks

Generally soft drinks are manufactured by adding water and concentrated flavored base to the container (can or bottle) and carbonating the mixture. Some processors may produce their own flavoring materials but most purchase them from specialists. Most of the waste load is generated in the preparation of the flavoring materials and in the bottle washing operation. Annually, wastewater discharges contain over 20 million pounds of BOD. About 94 percent of the plants discharge into municipal systems.

Flavoring

Raw materials used in producing flavorings, extracts and syrups include roots, seed, leaves, stems, blossoms, exudates, and bark from herbs, shrubs, and trees. Unit operations include milling, comminution, maceration, digestion, fermentation, percolation, extraction, distillation, concentration by freezing, and evaporation. Because of the wide variability in raw materials and processing methods "typical" or average water use and effluent BOD and SS loads, BOD concentrations may average near 500 mg/l with levels of about 50 mg/l for suspended solids. Ballpark figures for BOD and SS loads from this segment are 24 and 2 million pounds per year, respectively.

Roasted Coffee

In addition to coffee roasting the classification includes coffee extracts and instant and freeze-dried coffee. There were 80 major instant coffee plants in 1961 and from this segment of the industry comes the major wastewater and waste solids discharged. The instant coffee process contains the following equipment: roasters and grinders, perculators, cyclones, presses, driers and spray driers. Material balances show the presses to be by far the strongest wastewater source. Other major water discharges are vapors. The waste solids (grounds) average 30 cu. ft. or 650 pounds (dwb) per 1000 lbs of roasted and ground beans. The roasted coffee industry has significant wastewater discharges, nearly all made to tidewaters.

Manufactured Ice and Macaroni, Spaghetti, Vermicelli, and Noodle Industry

The manufactured ice industry discharge little in the way of organic pollutants and the macaroni, spaghetti, vermicelli, and noodle industry discharges are even more restricted to cooling water and boiler blowdown.

Food Preparation - Not Elsewhere Classified

The classification includes establishments primarily engaged in manufacturing prepared foods and miscellaneous food specialties such as baking powder, yeast, and other leavening compounds, chocolate and cocoa products - except confectionery, peanut butter, packaged tea, ground spices, vinegar and cider, and potato and corn chips. Of the 48 food preparations listed the known significant wastewater producers are the potato chip industry and yeast industry.

Potato Chips

The wastewaters in potato chips processing are from the peeling, slicing, washing, and rinsing the potatoes. The wastewaters are identical to those produced in the same operation prior to producing french fried potatoes.

Yeast

In 1967 the yeast industry produced 310 million pounds of compressed and active dry yeast. The value of the yeast was $50 million or 2 percent of the value of products in the food preparation category. The typical yeast plant processes sugar usually in the form of molasses and produces compressed yeast and alcohol. The alcohol is extracted (distilled) only from the first operation in yeast production. The process consists of cultivating, separating, washing, and dewatering of the yeast. The product, either compressed yeast or active dry yeast, is mainly used for baking.

The process wastewaters from a yeast plant are composed of burnt slop from alcohol distilling, wort (the consumed molasses) from cultivation, the washer water from yeast separation and the filter water from dewatering. The wastewaters are strong (15,000 mg/l BOD_5) with a pH of 5.5.

Egg Processing

The egg processing industry is changing rapidly and is expected to decrease to 200 large plants with 10% to 25% of these discharging to navigable waters. In 1967 dried, frozen, and liquid egg products amounted to 380 million pounds. The wastewater contains broken shells, wasted eggs, and chemicals used in the processing. Waste flows come from the breaking machines and clean up. Treatment systems include septic tanks, trickling filters, and extended aeration. Much of the waste is discharged to municipal plants.

Edible Oils

Edible oils account for a large percentage of the food energy of the average diet in the U. S. Products include shortening, cooking oils, salad oils, and margarine which are produced from soybeans, cottonseed, peanuts, corn, animal fats, and several other minor sources (coconuts, copra, linseed, and flaxseed). Soybeans are the major source of edible oils. The processing methods include rendering, hydrogenation, deodorization, fractional crystallization, interesterification, chilling, and filling. Other major products from the processing are meal and hulls which can be further processed into feeds and food. Production of edible soy protein is the most significant from the viewpoint of wastewater discharge. The degumming and caustic refining processes involve mixing water with the oil and then separating the two. Both processes offer special potential for waste load reduction. The other potential areas are in-plant control and solid-liquid separation systems prior to discharge to secondary treatment or a municipal sewer.

Research Strategy

Wastewaters from these industries are biologically treatable. Oil and water separation prior to biological treatment in the edible oil category is economically advantageous. The industries jointly use primary and secondary treatment systems. Because the production process utilizes relative clean raw products and is carried in highly regulated sanitary facilities, the wastewaters are not as subject to contamination that results in concern over health effects with closed loop systems. Future research projects should be building blocks in a closed cycle no-discharge system.

TANNING INDUSTRY

Standard Industrial Classification (SIC) classifies leather and leather products in major group 31. This group is further divided into: SIC 3111 (Leather Tanning and Finishing); SIC 313 (Boot and Shoe Cut Stock and Findings); SIC 314 (Footwear - Except Rubber); SIC 315 (Leather Gloves and Mittens); SIC 316 (Luggage); SIC 317 (Handbags and Other Personal Leather Goods); and SIC 319 (Leather Goods - Not Elsewhere Classified). The only segment that is of concern is leather tanning and finishing, all the rest are essentially "dry" processes of manufacturing and rely on the leather tanning and finishing division for their starting raw materials.

The manufacturing process in the leather tanning can be summarized as follows: the conversion of animal skins into leather by reacting the skin with trivalent chromium, tannin, or alum, or a combination of these three chemicals. The hair is usually removed from the skin and the hide is then treated to remove unwanted flesh or protein. The skin is then placed in contact with one or a combination of two tanning agents such as trivalent chromium, vegetable tannins, or alum. After tanning the hides are dried and some of the original oil restored by soaking in oils. The final step is dying of the leather to the desired color.

There are a total of 519 establishments in the leather tanning and finishing industry, including 314 tanneries, 70 converters, and 135 contract tanneries. Forty-one firms or 10.3 percent of the total account for 69 percent of the sales. This includes companies ranging in size from 5 to 50 million dollars in animal sales.

POLLUTION - WASTEWATER CHARACTERISTICS

Wastewater characteristics are shown in Table 1. This is a partial list of pollutants for only 3 of the steps in the tanning process. More extensive data are not available at this time concerning the wastewater characteristics for each subcategory of the tanning industry. However, it is evident that the wastewater is very high in BOD_5, total solids, oil, and grease. In addition, those tanneries using chrome tanning will have high levels of chrome in the effluent, whereas those employing vegetable tanning will have high color.

Table 1

Wastewater Characteristics of Tanning Industry

Parameter (kg/1000 kg hides)	MANUFACTURING STEP		
	Hide Curing	Wash and Soak	Degreasing
BOD_5	15,610	7-22	
COD	29,610	-	
Suspended Solids	10,400	8-43	
Total Solids	280,500	143-207	
Oil and Grease	40,200	-	100
Water Use/kg hides	0.24	-	

PRESENT TREATMENT PRACTICES

Information available shows that 60 percent of the tanneries discharge to a municipal treatment system. Those discharging to municipal systems also represent about 60 percent of the production capacity of the industry. Of the 140 wet process tanneries surveyed, 21 had on-site biological waste treatment plants, 3 employed activated sludge units, 15 employed lagoons (aerobic-anaerobic operations), and 3 used trickling filters.

Solids handling and disposal at tanneries have received little attention in the past, usually being disposed of in on-site open dumps. Some tanneries are beginning now to utilize pressure or vacuum filters or centrifuges for sludge dewatering prior to disposal.

Efforts by the tanneries to conserve water and restrict solids into the sewers have shown good results. Utilization of newer equipment that conserves water is also being done.

Ultimately, the tanning industry will face zero discharge requirements. Considering the diversity of the pollution parameters contained in their wastewater an open-cycle system of discharge will most probably be the method of choice. The use of continuous processing apparatus instead of batch type of operation should be considered to meet the ultimate goals. Additionally, the conversion of nitrogen and BOD_5 to single cell protein by way of control fermentation process may be feasible for larger tanneries.

PROJECT INDEX

FOOD AND KINDRED PRODUCTS

	Grantee or Contractor	Project Status
DEQ	Dairy Research and Development Corporation	B
DFF	Farmbest, Incorporated	A
DIK	University of Virginia	A
DPE	Corn Products Company	B
DQV	Swift and Company	A
DSB	University of Oklahoma Research Institute	A
DSG	S. B. Foot Tanning Company	B
DSI	Beet Sugar Development Foundation	A
DXF	Crowley's Milk Company, Incorporated	B
DXL	National Canners Association Research Foundation	A
EAE	National Canners Association Research Foundation	A
ECF	Oregon State University	A
EDK	National Canners Association Research Foundation	A
EDZ	Green Giant Company	A
EFM	Cardwell Lace Leather Company	A
EGU	Ohio State University Research Foundation	A
EGV	Gold Kist Poultry Division	A
EHS	Melbourne Water Science Institute	A
EHT	North Star Research and Development Institute	A
EHU	National Canners Association Research Foundation	A
EHV	The R. T. French Company	A
EIG	Western Potato Service, Incorporated	A
EKQ	Kent Cheese Company	A
EOF	Illinois Packing Company	C

	Grantee or Contractor	Project Status
EPC	Blueside Real Estate, Inc.	B
ESC	American Crystal Sugar Company	B
ESY	RAI Research Corporation	A
EUB	John Morrell and Company	B
EUZ	Widmer's Wine Cellars, Incorporated	B
EZP	FMC Corporation	A
EZY	Winter Garden Citrus Products Cooperative	A
FAD	Snokist Growers	A
FAK	Beet Sugar Development Foundation	A
FDK	Archer Daniels Midland Company	B
FDR	University of Puerto Rico	C
FDS	Beefland International, Incorporated	A
FJK	Ebinger Baking Company	C
FLL	American Distilling Company	A
FMF	Iowa Beef Packers, Incorporated	C
FQE	National Canners Association	A
FRW	Tabor City Foods, Incorporated	B
FTC	Resource Engineering Associates	C
FUR	Central Soya Company, Incorporated	B
GPP	W. E. Reeves Packinghouse	B
HCW	Anheuser Busch Incorporated	A
HFY	Del Monte Corporation	B
HPC	California Department of Agriculture, Wine Advisory Board	B
HRR	Amber Labs Division, Milbrew, Incorporated	A

	Grantee or Contractor	Project Status
PAV	National Canners Association Research Foundation	A
WP 1486	University of Washington	A
WPD 93	Beet Sugar Development Foundation	A
WPRD 133	A. C. Lawrence Leather Company	A
WPD 185	University of Cincinnati	A
WPRD 38	Minute Maid Company	A
WPRD 151	National Canners Association Research Foundation	A
800250	National Canners Association Research Foundation	B
800746	Oklahoma State University	A
800747	Milbrew Incorporated	B
800904	American Shrimp Canners Association	A
800930	Pacific Egg and Poultry Association	B
800935	Bacardi Corporation	A
801007	Oregon State University	B
801037	Pfister and Vogel Tanning Company	B
801432	Winter Garden Citrus Products	B
801484	University of Wisconsin	A
801684	American Frozen Food Industry	B
801970	Maryland State Department of Health	A
802174	Cornell University	B
802253	Armour Company	B
802420	Hilo Coast Processing Company	B
802833	University of Wisconsin	B
802958	Dulaney Foods	B
803251	National Canners Association	B

	Grantee or Contractor	Project Status
803280	Snokist Growers	B
803301	Oregon State University	B
803307	Snokist Growers	B
803312	American Frozen Foods Institute	B
803321	Tosi Trading Company	B
803325	Maryland State Department of Health	B
803338	American Shrimp Canners Association	B

Project Status:

A - Completed, Final Report Available
B - Project Ongoing
C - Project Discontinued

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL. 92-500)

PROJECT NUMBER: DEQ

TITLE OF PROJECT: Elimination of Pollution by and Utilization of Protein Concentrates (Dried Whey) from Milk Residues of Cheese Making

GRANTEE OR CONTRACTOR:

Dairy Research and Development Corporation
111 Broadway
New York, New York 10006

EPA PROJECT OFFICER:

Mr. Max Cochran
NERC
200 S.W. 35th Street
Corvallis, Oregon 97330

Project Site: Vernon, New York

DESCRIPTION OF PROJECT

Award Date: December 1968

Completion Date: June 1973

Project Cost: $2,499,038

Federal Cost: $551,350

Summary:

A development and full-scale demonstration for a process for the conversion of dairy whey into saleable food products by evaporation and spray drying methods will be undertaken in the project. The conversion of whey to a useable food product in lieu of its disposal as a waste product from cheese manufacturing is the pollution abatement method to be developed and demonstrated. Research will be conducted on the use of dried whey as a supplement to various food products.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DFF

TITLE OF PROJECT: Waste Treatment Facility, Farmbest, Inc., Denison, Iowa

GRANTEE OR CONTRACTOR:

Farmbest, Inc.
Denison, Iowa

EPA PROJECT OFFICER:

Otmar Olson
Region VII, EPA
911 Walnut Street
Kansas City, Missouri 64106

Project Site: Denison, Iowa

DESCRIPTION OF PROJECT

Award Date: October 1968

Completion Date: June 1970

Project Cost: $755,587

Federal Cost: $289,790

Summary:

Studies were conducted to demonstrate the efficiency and suitability of using dissolved air flotation, anaerobic lagoons, plastic media trickling filters and chlorination as a system for treating 1 mgd of wastewater from a meat packing plant. The primary objective of the study was to determine if the plastic media filters could be used to replace the aerobic lagoon system normally used to treat the anaerobic lagoon effluent. - The overall reduction of 5-day Biochemical Oxygen Demand (BOD_5) through the system averaged 98.5% over the ten month evaluation period leaving a discharge concentration of 61 mg/1. Suspended solids were reduced 95.4% through the entire system, leaving an effluent concentration of 90 mg/1 after chlorination. The BOD_5 reduction in the anaerobic lagoons averaged 82% and accounted for the majority of BOD_5 removed in the system. The BOD_5 reduction through the plastic media trickling filters averaged 74% of the applied loading which was below the 91% efficiency expected during design. Hydraulic overload, organic overload, and possibly grease concentrations, contributed to the lower-than-expected performance.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DIK

TITLE OF PROJECT: Anaerobic - Aerobic Lagoon Treatment for Vegetable Tanning Wastes

GRANTEE OR CONTRACTOR:

University of Virginia
Department of Civil Engineering
Charlottesville, Virginia 22903

EPA PROJECT OFFICER:

Mr. George Webster
Industrial Pollution Control
Division (RD-679)
Washington, D. C. 20460

Project Site: Luray, Virginia

DESCRIPTION OF PROJECT

Award Date: January 1969

Completion Date: May 1970

Project Cost: $68,500

Federal Cost: $17,801

Summary:

A field demonstration lagoon was operated at Virginia Oak Tannery, Inc., Luray, Virginia, to evaluate the effectiveness of an anaerobic-aerobic lagoon in treating spent vegetable tannins blended with batepool and soak wastewaters. The anaerobic-aerobic lagoon system was used to treat combined waste streams with a BOD_5 concentration of approximately 100 mg. Aeration and volume of the lagoon were fixed and flow to the system was varied. The system load varied by increasing the flow so as to observe five operational phases. Operational phases were designed to cause the system to go from aerobic conditions to anaerobic-aerobic.

A completely mixed aeration unit was used in the laboratory to study the biological degradation of spent vegetable tannins. It was found that approximately 60% of the COD of spent vegetable tannins is not biological degradable and the generally accepted substrate-growth interaction relationship required modification to take into account the non-degradable fraction of COD. Yield coefficients, endogenous respiration rate, and specific growth were computed from the results of the laboratory study.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DPE

TITLE OF PROJECT: Treatment of Wastes from the Wet-Milling Industry

GRANTEE OR CONTRACTOR:

Corn Products Company
Corporate Engineering
P. O. Box 345
Argo, Illinois 60501

EPA PROJECT OFFICER:

Mr. Max Cohran
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Pekin, Illinois

DESCRIPTION OF PROJECT

Award Date: July 1968

Project Cost: $2,656,400

Completion Date: September 1973

Federal Cost: $482,680

Summary:

This project entails the design, construction, operation, and an economic and technical evaluation of a 1-mgd, completely mixed aerobic system for treatment of corn refining wastes.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DQV

TITLE OF PROJECT: Removal and Recovery of Fatty Materials from Edible Fat and Oil Refinery Effluents

GRANTEE OR CONTRACTOR:

Swift and Company
R&D Center
1919 Swift Drive
Oak Brook, Illinois 60521

EPA PROJECT OFFICER:

Mr. Clifford Risley
Region V, EPA
1 North Wacker Drive
Chicago, Illinois 60606

Project Site: Bradley, Illinois

DESCRIPTION OF PROJECT

Award Date: July 1968

Project Cost: $389,970

Completion Date: November 1972

Federal Cost: $249,307

Summary:

New full-scale equipment was added to existing standard waste treatment equipment at the Swift & Company Edible Oil Refinery at Bradley, Illinois. Synthetic acrylamide polymer flocculants with alum, and impressed current, were evaluated for removal of fatty materials from the plant wastewater. An in-plant wastewater survey was made. A DeLaval PX-213 bowl opening disc stack centrifuge was successfully tested to concentrate the removed fatty material after caustic and sulfuric acid treatment. The 7000 pounds daily of recovered oil (98% ether soluble), worth 4-1/4 to 4-5/8 cents per pound, could offset 60% of the total waste treatment direct operating costs.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DSB

TITLE OF PROJECT: Demonstration of a Full-Scale Waste Treatment System for a Cannery

GRANTEE OR CONTRACTOR:

Univ. of Oklahoma Research Institute
1808 Newton Drive
Norman, Oklahoma 73069

EPA PROJECT OFFICER:

Mr. George Putnicki
Region VI, EPA
1402 Elm Street
Dallas, Texas 75202

Project Site: Stillwell, Oklahoma

DESCRIPTION OF PROJECT

Award Date: July 1968

Project Cost: $117,807

Completion Date: August 1970

Federal Cost: $75,226

Summary:

The objective of this study was to determine the removal efficiencies of a two-stage aerobic biological treatment system while processing high strength, large volume, nutritionally unbalanced cannery wastes, and to determine the waste characteristics resulting from the processing of a wide variety of fruits and vegetables. The system was studied over one operating season and data collected on the removal efficiencies of each unit process in the system. The treatment system performed more efficiently than expected in the design assumptions. Removal efficiencies of greater than 95% were obtained for most of the processing season, even though because of plant expansion the organic and hydraulic load was higher than expected. It has been demonstrated conclusively that: (1) The Stilwell canning wastes can be treated successfully by a two-stage activated sludge process; (2) The two-stage aeration process is very stable and capable of accepting shock loads without being adversely affected: (3) The two-stage aeration process is a flexible system allowing adequate capacity for varying waste loads: that is, the units can be operated individually or in combination to match the flow and strength variations. This provides high treatment efficiencies at the lowest operational cost; (4) Any one of the units, such as the minimal solids unit, can be started up readily by recycling the mixed liquor from one of the operating units.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DSG

TITLE OF PROJECT: Aerobic Biological Treatment, Sludge Dewatering, and Disposal and Effluent Reuse for a Side Leather Tannery

GRANTEE OR CONTRACTOR:

S. B. Foot Tanning Company
Red Wing, Minnesota

EPA PROJECT OFFICER:

Mr. Clarence C. Oster
Minnesota - Wisconsin Field
Office, EPA
7401 Lyndale Avenue South
Minneapolis, Minnesota 55423

Project Site: Red Wing, Minnesota

DESCRIPTION OF PROJECT

Award Date: May 1968

Project Cost: $2,046,268

Completion Date: May 1972

Federal Cost: $475,000

Summary:

This project will provide a full-scale demonstration and investigation of primary sedimentation, biological secondary treatment utilizing aerated lagoons, and primary and secondary sludge dewatering and disposal by means of pressure filtration and incineration. The system will treat the total waste flow of 2.1 mgd from the side leather tannery. In addition, an evaluation will be conducted to determine the influence of final treatment plant effluent reuse on hide processing and quality of the finished product by reusing it in the "limepaddle" and "wash soak" tanning operations.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DSI

TITLE OF PROJECT: State-of-the-Art of Sugarbeet Processing Waste Treatment

GRANTEE OR CONTRACTOR:

Beet Sugar Development Foundation
156 South College Avenue
P. O. Box 538
Fort Collins, Colorado 80521

Project Site: Fort Collins, Colorado

EPA PROJECT OFFICER:

Mr. Kenneth Dostal
Pacific Northwest Environmental
Research Laboratory, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

DESCRIPTION OF PROJECT

Award Date: April 1969

Project Cost: $15,900

Completion Date: June 1970

Federal Cost: $14,310

Summary:

The beet sugar industry in the United States produces annually more than 3 million tons of sugar from about 25 million tons of beets grown in 19 states. This paper reports the waste disposal practices of the 58 beet sugar factories operating in 1968-69 and provides an estimate of the amount of pollution of streams attributable to these factories. It is shown that, although stream pollution has been greatly reduced, the beet industry still discharges to streams 3.15 pounds BOD per ton of beets sliced or a total of about 79 million pounds annually. Amounts of water used are reported and methods of reuse of water described. Estimates of total settleable solids are made; methods of elimination are described. Effectiveness of some biological treatments are estimated. Needed research is briefly outlined. Costs of waste disposal facilities and annual operating costs are shown for many of the plants. A brief description of the beet sugar process is furnished. Current practices employed by a selected group of sugarbeet processing plants in several Western European countries are also described.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DXF

TITLE OF PROJECT: Development and Demonstration of an Ultrafiltration Plant for the Abatement of Pollution from Cottage Cheese Whey

GRANTEE OR CONTRACTOR:

Crowley's Milk Company, Inc.
145 Conklin Avenue
Binghamton, New York 13902

EPA PROJECT OFFICER:

Mr. Max W. Cochrane
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Binghamton, New York (Phase I)
LaFargeville, New York (Phase II)

DESCRIPTION OF PROJECT

Award Date: July 1969

Project Cost: $914,081

Completion Date: March 1973

Federal Cost: $495,856

Summary:

A two-stage ultrafiltration system for the separation and concentration of protein and lactose or straight acid whey concentration with a resulting influent BOD reduction of 99% will be demonstrated. Phase I, lasting 13 months, calls for the design, detailed engineering, construction, operation, and evaluation in Binghamton, New York of a 10,000 lb/day UF system and will include the design of a 250,000 lb/day system for full-scale demonstration under Phase II. Duration of Phase II will be 17 months.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DXL

TITLE OF PROJECT: Reduction of Salt Content of Food Processing Liquid Waste Effluent

GRANTEE OR CONTRACTOR:

National Canners Association
Research Foundation
1133 20th Street
Washington, D. C. 20036

EPA PROJECT OFFICER:

Mr. Kenneth Dostal
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Berkeley, California

DESCRIPTION OF PROJECT

Award Date: December 1969

Project Cost: $94,208

Completion Date: May 1971

Federal Cost: $64,382

Summary:

Olive processing brines containing 0.05 to 0.7 percent sodium chloride were passed through a mixed bed of cation and anion exchange resins. The effect of influent composition on the composition of effluent from the ion exchange unit was investigated, using a range of influent pH, salt content, and COD levels. The unit was operated at sodium chloride levels of 500 to 7,000 ppm with random pH and COD levels. The highest removal of sodium chloride (94%) was obtained at a level of 2,700 ppm sodium chloride in the influent. With pH and COD held constant the salt content of the influent was varied between 600 and 6,000 ppm. The effluent sodium chloride content was approximately 150 ppm at 600, 1,000, and 2,700 ppm and was 790 ppm at 6,000 ppm influent concentration. - The resins were regenerated using a solution of calcium hydroxide. To establish the maximum salt concentration attainable in the regenerant effluent, the regenerant was repeatedly recycled through the resin bed. The sodium chloride content of recycled regenerant solutions was increased 40 percent over the influent brine level, and evidence was obtained that at least a ten-fold increase was possible. - The cost of desalination of dilute food processing brines by this ion-exchange treatment was estimated at $0.26 per 1,000 gallons of influent.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EAE

TITLE OF PROJECT: Evaluation of Controlled Temperature and Forced Aeration in Trickling Filter Treatment of Food Canning Wastewaters

GRANTEE OR CONTRACTOR:

National Canners Association
Research Foundation
1133 20th Street, N.W.
Washington, D. C. 20036

EPA PROJECT OFFICER:

Mr. William Pierce
Region IX, EPA
760 Market Street
San Francisco, California 94102

Project Site: San Jose, California

DESCRIPTION OF PROJECT

Award Date: June 1969

Project Cost: $28,712

Completion Date: May 1970

Federal Cost: $18,350

Summary:

Two high rate trickling filters were evaluated for treating fruit canning liquid wastes: one was 7.5 feet deep and had provisions for heating the treated waste and for forced aeration: the other was 21.5 feet deep and was operated at ambient temperatures and with natural aeration: both were packed with a high void ratio plastic medium. - Nitrogen added to the cannery waste improved the removal of BOD and COD. In the absence of added nitrogen a thick fungal slime developed with odors characteristic of anaerobic microbial action. More often than not, percent removals declined with increasing organic loadings: the pounds of BOD removed per unit volume increased with high loadings. Elevated temperatures were not consistently shown to improve the performance of the experimental filter. Forced aeration was not proven beneficial but maintained higher levels of dissolved oxygen. - The top third of the 21.5 foot trickling filter accomplished 80% of the filter's total BOD removal under a light hydraulic loading. The natural aeration filter maintained a slightly higher dissolved oxygen concentration in the effluent than did the experimental filter with forced aeration.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: ECF

TITLE OF PROJECT: Current Practice in Seafoods Processing Waste Treatment

GRANTEE OR CONTRACTOR:

Department of Food Science and Technology
Oregon State University
Corvallis, Oregon 97331

EPA PROJECT OFFICER:

Mr. Kenneth Dostal
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Corvallis, Oregon

DESCRIPTION OF PROJECT

Award Date: July 1969

Project Cost: $18,652

Completion Date: January 1971

Federal Cost: $17,695

Summary:

The final report on this project contains discussions of the processing of the major United States seafood species, the resultant wastewater strengths and flows, solid wastes magnitudes, current treatment and by-product recovery methods, and current and recommended research in water pollution abatement. The geographic distribution of fish and shellfish landings and products is described. The report is based on a comprehensive literature review and extensive on-site investigations of current research, processing, and treatment activities in the major seafoods centers of the United States.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EDK

TITLE OF PROJECT: Production and Disposal Practices for Liquid Wastes from Canning and Freezing Fruits and Vegetables

GRANTEE OR CONTRACTOR:

National Canners Association
Research Foundation
1133 20th Street, N.W.
Washington, D. C. 20036

EPA PROJECT OFFICER:

Mr. William Pierce
Region IX, EPA
760 Market Street
San Francisco, California 94102

Project Site: NCA, Berkeley, California
Univ. of Wisconsin, Madison, Wisconsin

DESCRIPTION OF PROJECT

Award Date: May 1969

Completion Date: September 1970

Project Cost: $22,542

Federal Cost: $20,025

Summary:

This study estimates that the 1800 plants in the U. S. canned and frozen fruits and vegetables industry annually utilize 26 million tons of raw product, discharge 83 billion gallons of water, and generate 800 million pounds of biochemical oxygen demand, 392 million pounds of suspended solids, and 8 million tons of solid residuals. Increased mechanical harvesting is increasing problems in product damage, soil, and loss in yields. Water is extensively recirculated in food processing plants but additional water savings by reconditioning and reuse are needed. High pollutional loads are generated in blanching and peeling operations and large amounts of relatively clean water are discharged from cooling and condensing operations. Solids are commonly removed from wastewater by screening. The solid residuals from some commodities are used in large quantities for animal feed. Biological processes are widely used to treat food processing wastewater. Anaerobic, aerobic, and aerated lagoons, activated sludge, trickling filter, and other treatment systems are discussed. Roughly half of the canning and freezing plants discharge their wastewaters to city treatment systems and about one-fifth use spray irrigation for liquid waste disposal.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EDZ

TITLE OF PROJECT: Pilot-Plant Installation for Use of Fungi Imperfecti on Vegetable Wastes

GRANTEE OR CONTRACTOR:

Green Giant Company
LeSueur, Minnesota 56058

EPA PROJECT OFFICER:

Mr. Kenneth Dostal
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: North Star Research and Development Institute, Minneapolis, Minnesota

DESCRIPTION OF PROJECT

Award Date: July 1969

Project Cost: $72,860

Completion Date: December 1970

Federal Cost: $49,742

Summary:

The use of the imperfect fungus, Trichoderma viride, to treat corn and pea wastes has been tested in continuous fermentation at the 10,000 gallon scale. Both a pool unit and an oxidation ditch were tested. The pH was 3.7, and ammonium ion and phosphate were added. The average residence time was 20 hours. An aerated lagoon was also operated to compare with the two fungal systems. - In the fungal systems, about 96% removal of BOD_5, 88% removal of COD, and 93% removal of TOC was achieved on corn canning wastes. Performance on pea canning wastes was somewhat less. Essentially zero levels of ammonia nitrogen and inorganic phosphate could be attained in the effluent stream. - Fungal yields, on a dry-weight basis, were about 50% of the BOD_5 of the feed, and the protein content of the dry mycelium was about 50%. - Costs are estimated at 4.9 cents per pound of BOD_5. Sale of mycelium as feed could decrease this to 3.1 cents. Operation on a year-around basis with sale of the mycelium would decrease costs to about 1.1 cents per pound of BOD_5. Direct feeding of the mycelium without drying could further reduce the net cost to about 0.8 cent per pound of BOD_5.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EFM

TITLE OF PROJECT: Complete Treatment of Tannery Industrial Waste for Chrome Tanning, Alum Tanning, and Vegetable Tanning

GRANTEE OR CONTRACTOR:

Caldwell Lace Leather Company
Auburn, Kentucky 42206

EPA PROJECT OFFICER:

Mr. James Westrick
NERC, EPA
Cincinnati, Ohio 45268

Project Site: Auburn, Kentucky

DESCRIPTION OF PROJECT

Award Date: December 1966

Project Cost: $68,200

Completion Date: March 1972

Federal Cost: $46,340

Summary:

The Caldwell Lace Leather Co. of Auburn, Kentucky, a small tannery using primarily alum tanning but some chrome and vegetable tanning, received a demonstration grant in 1967 from the FWPCA to investigate and demonstrate methods of treating tannery wastes for discharge to a small stream. A research contract with Vanderbilt University produced findings which have previously been reported and are reviewed herein. - A modified completely-mixed activated sludge plant was constucted, along with facilities to handle specific problem wastes. After operating for a year, an EPA survey team conducted a study which showed that the plant was performing as predicted by the research phase, except for solids carryover from the secondary clarifier due to mechanical problems. After the problems were corrected, the plant began producing an effluent which more than met expectations, removing 97% of the suspended solids and 95% of the BOD. Due to conservation measures inside the tannery, however, the load on the plant is somewhat less than the design load, so the plant is operating as an extended aeration plant.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EGU

TITLE OF PROJECT: State-of-the-Art of Dairy Plant Wastes and Waste-Treatment Systems

GRANTEE OR CONTRACTOR:

Ohio State University Research Foundation
1314 Kinnear Road
Columbus, Ohio 43212

EPA PROJECT OFFICER:

Mr. Eugene Harris
National Environmental Research
Center, EPA
Cincinnati, Ohio 45268

Project Site: Columbus, Ohio

DESCRIPTION OF PROJECT

Award Date: July 1969

Completion Date: May 1971

Project Cost: $18,505

Federal Cost: $12,954

Summary:

This paper reports a comprehensive study of the state-of-the-art of dairy wastes, their control and treatment, both from the point of view of past literature and current industrial knowledge and practice. Research needs are reviewed in light of on-going research and the priority of the needs.

The dairy industry has only limited knowledge of the Biological Oxygen Demand (BOD) of its wastewaters. Even less information is available concerning Chemical Oxygen Demand (COD) and refractory organic and inorganic components of these wastes.

BOD-COD relationships are reviewed together with available knowledge on all aspects of waste composition. Sources and control of in-plant wastes are presented. Detergents and sanitizers contribute to the BOD load, to refractory COD and to the toxicity of some dairy food plant wastes. Waste treatment methods are critically reviewed. The basic information needed for intelligent design of dairy food plant waste treatment facilities and for their optimal operation are not generally available. Most dairy waste treatment systems fail at least once a year and generally are less than 75% efficient about 25% of the time. Problems of shock loading, whey, cottage cheese wash water and the presence of surfactants appear to contribute to the difficulty of continuing efficient dairy food plant waste treatment.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EGV

TITLE OF PROJECT: Water and Waste Management in Poultry Processing

GRANTEE OR CONTRACTOR:

Gold Kist Poultry Division
Cotton Producers Association
P. O. Box 2210
Atlanta, Georgia 30301

EPA PROJECT OFFICER:

Mr. Harold Snyder
Oil and Hazardous Materials
Program, Water Quality Research, EPA
Washington, D. C. 20460

Project Site: Durham, North Carolina

DESCRIPTION OF PROJECT

Award Date: July 1969

Project Cost: $283,381

Completion Date: December 1972

Federal Cost: $198,366

Summary:

A typical broiler processing plant was used to evaluate changes in equipment and processing techniques to reduce water use and waste load. Production at the plant was through two processing lines and totaled approximately 70,000 broilers per day. Benchmark results indicated a water use of 12.28 gallons per bird received which was reduced by 32 percent to 7.81 gallons per bird received. Benchmark results indicated a daily waste load of 3970 lbs BOD_5 which was reduced by 66 percent to 1355 lbs BOD_5. Changes made are detailed and economic analysis showed all to be profitable for the plant with an average annual net savings of $4.08 per 1000 broilers processed. An initial investment of $93,065 was needed. Annual operating costs were $31,023 with annual net savings of $72,193. A water and waste management program is detailed. Microbiological analyses indicated no deterioration in product quality as a result of the changes.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EHS

TITLE OF PROJECT: Cannery Waste Treatment by Lagoons

GRANTEE OR CONTRACTOR:

Melbourne Water Science Institute
Water Science Laboratories
15-21 Earl Street
Carlton, Victoria, Australia

EPA PROJECT OFFICER:

Mr. Kenneth Dostal
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Shepparton, Victoria, Australia

DESCRIPTION OF PROJECT

Award Date: May 1969

Project Cost: $61,810

Completion Date: January 1972

Federal Cost: $11,920

Summary:

Various mixtures of fruit and vegetable cannery wastes, and domestic sewage were treated by anaerobic lagoons followed by an oxidation ditch for a two-year period. The anerobic lagoons consistently achieved BOD reductions of 75 to 85 percent at loadings up to 400 lbs BOD per day per acre provided adequate inorganic nutrients were present. The oxidation ditch reduced the BOD to low levels and was shown to be very stable against overload. Power requirements were less than 0.5 kw hr/lb of BOD removed and the oxygenation capacity of the rotor was about 30 lbs of BOD per foot of length.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EHT

TITLE OF PROJECT: Use of Fungi Imperfecti in Waste Control

GRANTEE OR CONTRACTOR:

North Star Research and
Development Institute
3100 38th Avenue South
Minneapolis, Minnesota 55406

Project Site: Minneapolis, Minnesota

EPA PROJECT OFFICER:

Mr. Kenneth Dostal
Pacific Northwest Environmental
Research Laboratory, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

DESCRIPTION OF PROJECT

Award Date: September 1967

Completion Date: July 1970

Project Cost: $118,585

Federal Cost: $ 76,585

Summary:

In this project, 45 species of 12 genera of the Fungi Imperfecti were screened for those fungal candidates best able to rapidly convert soluble and suspended organic material (as measured by BOD) from corn- and soy food-processing waste streams to mycelial protein. Rapidly growing fungal strains were selected which were readily removed from the digested waste effluents by coarse filtration. *Trichoderma viride*, *Gliocladium deliquescens*, and either *Aspergillus oryzae* or *G. deliquescens* gave the best results on corn, soy, and SO_2-containing soy wheys, respectively. Optimal growth conditions included pH of 3.2 to 3.5, and a temperature of 30°C. Oxygen requirements were relatively low (1 lb O_2/6-7 lb COD removed). Nitrogen and phosphate additions were required for the corn digestion system, and additions of sulfuric acid were necessary to adjust the pH.

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EHU

TITLE OF PROJECT: Reconditioning of Food Processing Brines

GRANTEE OR CONTRACTOR:

National Canners Association Research
Foundation
1133 20th Street, N. W.
Washington, D. C. 20036

EPA PROJECT OFFICER:

Mr. William Pierce
Region IX, EPA
760 Market Street
San Francisco, California 94102

Project Site: Central Valley, California

DESCRIPTION OF PROJECT

Award Date: February 1968

Project Cost: $45,000

Completion Date: March 1971

Federal Cost: $31,500

Summary:

In this project, storage brines and processing waters from the production of canned ripe olives and glass packed green olives were treated with activated carbon. The reuse potential of reconditioned brines was evaluated. Reconditioned storage brines can be used to store freshly harvested olives for commercially significant periods. Canned samples prepared from olives stored in reconditioned brine were of good quality. Reconditioned brines of lower salt content were reused with no detectable effect on the quality of the final product.

Estimates for commercial application of activated carbon treatment of storage brines show a cost per ton of olives stored of $3.64 when capital costs are amortized over 10 years for a cannery storing 5,000 tons of olives annually. This value can also be expressed as a cost of $36.40 for each 1,000 gallons of reconditioned brine produced. Ten olive canneries reconditioning brine and sending spent carbon to a centrally located reactivation facility would have a cost of $1.28 per ton of olives stored or $12.80 for each 1,000 gallons of reconditioned brine produced.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EHV

TITLE OF PROJECT: Aerobic Secondary Treatment of Potato Processing Wastes

GRANTEE OR CONTRACTOR:

The R. T. French Company
Shelley, Idaho

EPA PROJECT OFFICER:

Mr. James Boydston
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Shelley, Idaho

DESCRIPTION OF PROJECT

Award Date: August 1967

Project Cost: $690,310

Completion Date: March 1971

Federal Cost: $483,217

Summary:

As described in the final report to this report, the new secondary treatment facility at the R. T. French Company, has demonstrated the feasibility of a complete mix activated sludge system for secondary treatment of potato processing wastes. The secondary treatment facility was designed for an average daily flow of 1.25 million gallons per day and a BOD loading of 14,000 lbs per day. Frequent aerator shutdowns following mechanical problems have limited oxygen transfer and biological activity in the aeration basins; however, BOD removals of over 90% have been obtained for extended periods of time, demonstrating the applicability of the activated sludge process for treating the wastes. These removals have been obtained with: (1) MLSS concentrations between 2,000 mg/1 and 8,000 mg/1; (2) Aeration basin D.O. concentrations between 0.3 m/1 and 5.2 mg/1, (3) Aeration basin temperatures between 45 degrees F and 67 degrees F; (4) Aeration basin pH between 7.1 and 8.4; (5) Organic loadings between 10 and 120 lb BOD/1,000 cu ft/day; (6) Hydraulic detention times of 0.9 to 8.7 days, and (7) BOD/MLVSS ratios of 0.15 to 0.47.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EIG

TITLE OF PROJECT: Full-Scale Demonstration and Evaluation of Potato Dry and Wet Caustic Peeling Processes

GRANTEE OR CONTRACTOR:

Western Potato Service, Inc.
P. O. Box 1391, Highway #2 West
Grand Forks, North Dakota 58201

EPA PROJECT OFFICER:

Mr. Kenneth Dostal
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Presque Isle, Maine (Wet)
Grand Forks, North Dakota (Dry)

DESCRIPTION OF PROJECT

Award Date: July 1969

Project Cost: $1,042,212

Completion Date: March 1973

Federal Cost: $396,574

Summary:

The objective of this grant will be to demonstrate at full scale the economics and pollution reduction characteristics of a potato "dry" caustic peeling system and use as a base for comparison data to be obtained from a similar facility employing the conventional "wet" peeling operation.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EKQ

TITLE OF PROJECT: Kent Cheese Company - Waste Treatment Facility

GRANTEE OR CONTRACTOR:

Kent Cheese Company
1931 North 15th Avenue
Melrose Park, Illinois 60160

EPA PROJECT OFFICER:

Mr. Dennis W. Taylor
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Kent, Illinois

DESCRIPTION OF PROJECT

Award Date: September 1969

Completion Date: January 1973

Project Cost: $65,722.80

Federal Cost: $46,006.00

Summary:

In this project the effectiveness of aerated lagoons for the treatment of cheese whey process rinse water, in addition to the effluent from a reverse osmosis unit was demonstrated. The treatment system utilizes two aerobic lagoons in series with submerged mechanical aeration equipment producing an extended aeration process. Data was collected to evaluate the extended aeration process on the aforementioned cheese whey wastewater streams.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EOF

TITLE OF PROJECT: A Method of Manure Disposal for a Beef Packing Operation

GRANTEE OR CONTRACTOR:

Illinois Packing Company
911 West 37th Place
Chicago, Illinois 60609

EPA PROJECT OFFICER:

Mr. Jack L. Witherow
RSKERL, EPA
P. O. Box 1198
Ada, Oklahoma 74820

Project Site: Illinois Packing Co.

DESCRIPTION OF PROJECT

Award Date: October 1969

Project Cost: $156,000

Completion Date: June 1971

Federal Cost: $93,400

Summary:

In this 20-month project, demonstration of the feasibility of the incineration of cattle paunch and ground manure was to be undertaken. The project objectives were to include the following:

1. Segregation of existing process waste streams for concentration of waste solids.
2. Development of physical parameters for process waste streams.
3. Design and construction of a fluidized bed incineration unit.
4. Investigation and documentation of the treatment system performance, the economics, optimal operating characteristics and the significance of the system in terms of application of other segments of the animal production industry.

NOTE: This project was discontinued.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EPC

TITLE OF PROJECT: Removal and Recovery of Sulfide from Tannery Wastes

GRANTEE OR CONTRACTOR:

Blueside Real Estate, Inc.
800 N. Atlantic Avenue
Kansas City, Missouri 64116

EPA PROJECT OFFICER:

Mr. William Banks
Region VII, EPA
911 Walnut Street
Kansas City, Missouri 64106

Project Site: St. Joseph, Missouri

DESCRIPTION OF PROJECT

Award Date: April 1970

Project Cost: $388,900

Completion Date: April 1972

Federal Cost: $110,950

Summary:

The basic objectives of the project are to translate pilot-plant results into the development and demonstration on a plant scale of a process for removing sulfide from the effluent of a chrome tannery and recovering the sulfide in a form reuseable in the tannery. The project will demonstrate the technical feasibility of the sulfide removal method and will determine the economics of the process on a full-scale plant.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: ESC

TITLE OF PROJECT: Separation, Dewatering, and Disposal of Sugarbeet Transport Water Solids

GRANTEE OR CONTRACTOR:

American Crystal Sugar Co.
Boston Bldg., P. O. Box 419
Denver, Colorado 80201

EPA PROJECT OFFICER:

Mr. Harold Thompson
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Crookston, Minnesota

DESCRIPTION OF PROJECT

Award Date: October 1970

Project Cost:

Completion Date: September 1975

Federal Cost: $179,840

Summary:

This development and demonstration project is divided into two phases and will be conducted over a 31-month period. Phase I is a laboratory and pilot-scale development activity during which [illegible] the optimum solids-clarification environment will be determined. A pilot-scale vacuum filtration unit will be evaluated for its ability to dewater the settleable sugarbeet water solids. At the conclusion of Phase I, a judgment will be made as to whether the proposed dewatering system is the best method for handling the solids from the transport water wastes. - Phase II is a 12-month activity which will consist of the design, construction, and operation of a full-scale solids handling system (vacuum filtration). The full-scale facility will be operated and studied for one processing season so as to establish a good data base for industry-wide recommendations.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: ESY

TITLE OF PROJECT: Improvement of Treatment of Food Industry Waste

GRANTEE OR CONTRACTOR:

RAI Research Corporation
36-40 37th Street
Long Island City, New York 11101

EPA PROJECT OFFICER:

Mr. Allyn Richardson
Region I, EPA
John F. Kennedy Federal Bldg.
Boston, Massachusetts 02203

Project Site: Long Island City, New York

DESCRIPTION OF PROJECT

Award Date: January 1968

Completion Date: July 1969

Project Cost: $57,250

Federal Cost: $40,075

Summary:

Laboratory studies were conducted to determine the feasibility of reducing the COD demand of cheese whey waste generated from dairy processing plants. Three primary processing variables were studied: these were agitation, temperature, and current density. Results indicate electrolytic oxidation efficiency was best at 70°C, agitation at 9.6 feet per second and a current density of 9.5 amperes per square foot (equivalent to 6 amperes in the test cell investigated). Concentration of 60% of the whey protein was also possible by collection of the froth produced during electrolysis. This mechanism of COD reduction could afford recoverable protein from the whey. Carbon adsorption of the electrolyzed whey was also shown to be extremely effective in reducing the COD. The carbohydrates after oxidation to carboxylic acids are very readily adsorbed, the carbon loading being in excess of that expected for secondary effluents. The feasibility of combining the electrolytic oxidation with froth collection and carbon adsorption is proposed as a possible attractive procedure for recovery of values from the whey.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EUB

TITLE OF PROJECT: Construction and Study of a Demonstration Plant Utilizing the Aerobic Channel Method for Treating Packinghouse Wastes

GRANTEE OR CONTRACTOR:

John Morrell and Company
Ottumwa, Iowa 52501

EPA PROJECT OFFICER:

Mr. Jack L. Witherow
RSKERL, EPA
P. O. Box 1198
Ada, Oklahoma 74820

Project Site: Ottumwa, Iowa

DESCRIPTION OF PROJECT

Award Date: December, 1966

Project Cost: $815,000

Completion Date: February, 1973

Federal Cost: $489,000

Summary:

Four oxidation channels will be constructed to handle an equivalent load of 20,000 lbs of BOD/day from a packinghouse on a 7-day basis with estimated flow of 3.5 mgd. The objective is to find an efficient, effective, and economical method of treating raw packinghouse wastes so they can be discharged directly into streams. - Each channel will be 460 ft x 60 ft with a capacity of 150,000 cu.ft. Channels 1 and 2 will receive raw wastewater from existing primary treatment systems. The overflow will be directed into Channels 3 and 4 which will be operated intermittently as aerator and settling basins. Channel 4 will allow the sludge to be returned to Channels 1 and 2 or removed for harvesting. The solids removed will be centrifuged or evaporated and dried. - The most feasible way of handling solids will be determined. Tests will be conducted to determine if the dried solids **can** be used on an animal-food supplement. - The process will be designed to give variable rates of aeration and flow to obtain maximum biochemical oxygen demand and nitrogen removal. The flow will be sampled and analyzed for total nitrogen, chemical oxygen demand, suspended solids, total solids, and grease; weekly samples will be tested for total volatile solids, total fixed solids, phosphate, total bacterial content, and coliform count.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EUZ

TITLE OF PROJECT: Winery Wastewater-Characterization and Treatment

GRANTEE OR CONTRACTOR:

Widmer's Wine Cellars, Inc.
Naples, New York 14512

EPA PROJECT OFFICER:

Mr. Dennis W. Taylor
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Naples, New York

DESCRIPTION OF PROJECT

Award Date: December 1969

Project Cost: $284,000

Completion Date: August 1973

Federal Cost: $148,900

Summary:

This project includes design, construction, and operation of an extended aeration waste treatment plant to treat the process wastewaters from a winery.

The activities of the project are the following:

1. Characterization of the winery wasteflow.
2. Design, construction, and operation of an extended aeration waste treatment system.
3. Study and documentation of the treatment system.
4. Optimization of the system.
5. Determination of the effectiveness of nutrient addition to the operation of the system.

The facility will be designed for a 120,000-gpd flow.

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EZP

TITLE OF PROJECT: Cannery Waste Treatment Kehr Activated Sludge

GRANTEE OR CONTRACTOR:

FMC Corporation
Central Engineering Laboratories
Box 580
Santa Clara, California 95052

EPA PROJECT OFFICER:

Mr. Kenneth Dostal
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Santa Clara, California

DESCRIPTION OF PROJECT

Award Date: December 1966

Project Cost: $43,200

Completion Date: January 1969

Federal Cost: $29,300

Summary:

The Kehr Activated Sludge Process (KASP) uses a completely mixed aeration tank with no intentional sludge wasting. The concentration of mixed liquor suspended solids was allowed to stabilize at some value as a result of cellular synthesis, endogenous loss, and washout in the effluent. The concentration of mixed liquor suspended solids ranged from 4,000 to 12,000 mg/liter. The BOD_5 of domestic sewage and cannery wastes varied from 200 to 2000 mg/liter. - Removals obtained were 80% reduction in the concentration of total organic carbon and 90% reduction in the concentration of BOD_5. - The process was able to undergo a 48-hr period of no organic loading with no loss of treatment efficiency when the organic load was returned. The KASP appears to have an application for pretreatment of industrial wastes prior to discharge to a municipal sewer. The KASP, when used in this manner, would handle intermittent waste discharge, produce 90% BOD_5 removal, and provide aerobic digestion within the aeration tank. - Exclusive of any primary treatment, the cost of treating 10 mgd of a waste containing 250 mg/liter of BOD_5 using this high solids activated sludge process is about 7¢/1000 gallons using gravity settling and about 29¢/1000 gallons using electroflotation. The cost of pretreating 1 mgd of a waste containing 2,000 mg/liter BOD is about 28¢/1000 gallons exclusive of primary treatment.

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EZY

TITLE OF PROJECT: Lime Treatment and Inplant Reuse of an Activated Sludge Plant Effluent in the Citrus Processing Industry

GRANTEE OR CONTRACTOR:

Winter Garden Citrus Products Cooperative
P. O. Box 399
Winter Garden, Florida

EPA PROJECT OFFICER:

Dr. David Hill
SERL, EPA
College Station Road
Athens, Georgia 30601

Project Site: Winter Garden, Florida

DESCRIPTION OF PROJECT

Award Date: December 1967

Project Cost: $397,300

Completion Date: August 1971

Federal Cost: $165,000

Summary:

A full-scale complete mixed activate sludge treatment system effectively treats concentrated wastewater from the Winter Garden Citrus Products Cooperative. This process has a BOD reduction capability of 99%: but it produces 0.5 to 0.6 lbs of waste sludge per pound of influent BOD. The efficiency was reduced by periodic foaming and solids carryover in the effluent caused by the unscheduled discharge of orange oil and peel press liquor to the treatment plant.

Controlling the addition of nitrogen and phosphorus to the influent of the nutrient deficient wastewater effectively controlled effluent nitrogen and phosphorus concentrations.

Waste sludge was mixed with citrus peel and processed as a cattle feed additive in the existing facilities. The waste activated sludge represented approximately 1.5 percent of the total cattle feed production on a dry weight basis. Treatment plant effluent was reused for barometric leg and cooling water and was then discharged.

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: FAD

TITLE OF PROJECT: Aerobic Treatment of Fruit Processing Wastes

GRANTEE OR CONTRACTOR:

Snokist Growers
Yakima, Washington

EPA PROJECT OFFICER:

Mr. James Boydston
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Yakima, Washington

DESCRIPTION OF PROJECT

Award Date: August 1967

Project Cost: $572,262

Completion Date: March 1970

Federal Cost: $347,669

Summary:

In 1966 it was determined that the Snokist Growers cannery in Yakima, Washington, was in need of further treatment facilities for the cannery waste before the waste could be discharged into the Yakima River. A system of aeration was proposed and a grant sought to aid in construction of facilities and to study the results of the treatment facility following construction. Facility construction proceeded in two stages with the addition of an aerated lagoon in 1967 and the addition of additional aeration and clarification facilities in 1968 to complete the treatment system. The treatment system performed more efficiently than initially expected in the original design assumptions, and nearly 99% of BOD and COD from the waste stream was accomplished during a major portion of the 1968 processing season. - The treatment systems were studied over the two operating seasons, and operated as an aerated lagoon, as an activated sludge treatment system, and as activated sludge system but including sludge reaeration. Data was collected on biological substrate assimilation, sludge growth, oxygen uptake and sludge settleability. Constants were obtained from this data. Success of the treatment system is described in the final report on the project and the costs of treatment computed. It is recommended that aerated lagoon treatment be used where 70% removal of BOD is desired and suspended solids are permissible in the effluent. Activated sludge treatment is recommended for greater than 90% BOD removal and where effluent suspended solids must be minimized.

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This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: FAK

TITLE OF PROJECT: Concentration of Sugar Beet Wastes for Economic Treatment with Biological Systems

GRANTEE OR CONTRACTOR:

Beet Sugar Development Foundation
156 South College Avenue
P. O. Box 538
Fort Collins, Colorado 80521

Project Site: Longmont, Colorado

EPA PROJECT OFFICER:

Mr. Ralph Scott
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

DESCRIPTION OF PROJECT

Award Date: December 1966

Completion Date: May 1970

Project Cost: $372,500

Federal Cost: $102,000

Summary:

A study of the variables influencing a closed loop recirculating flume water system for conveying sugarbeets for processing was conducted. The results show that high volume, high total solids transport (flume) waters can be recirculated with little or no discharge to receiving waters. Rapid removal of suspended solids was accomplished by screening, followed by continuous addition of lime prior to sedimentation. The build-up of total dissolved solids was no major problem, provided the pH was 10 or greater and that water temperature did not exceed 20°C. The system was designed for primary settling in two alternately used ponds. Settled mud was removed from one pond by clamshell while the other one was in service. The first settling pond effluent was subjected to secondary settling before returning to the fluming and washing operations. These segments of treatment essentially operated without odor. - Biological and nutritional data were collected. Results indicate that the end product water meets discharge standards, however wastes were retained for reuse in the system. Further work is needed on mud handling and odor abatement.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: FDK

TITLE OF PROJECT: ADM Company Wastewater Treatment

GRANTEE OR CONTRACTOR:

Archer Daniels Midland Company
4666 Faries Parkway
Decatur, Illinois 62525

EPA PROJECT OFFICER:

Mr. Jack Witherow
PNERL, EPA
Corvallis, Oregon

Project Site: Decatur, Illinois

DESCRIPTION OF PROJECT

Award Date: March 1970

Completion Date: September 1971

Project Cost: $245,254

Federal Cost: $106,677

Summary:

A full-scale (~0-5 mgd) development-demonstration project for emulsion breaking of the effluent wastewaters resulting from soybean processing for oil will be undertaken. The project will develop and install the required additional facilities to break tight emulsions currently being discharged to a municipal sewer system. The existing system contains an oil separator-skimmer and 1-day retention lagoon. To be explored will be primarily a two-stage chemical system, with other physical and biological alternatives also to be evaluated. Also to be demonstrated is an ion exchange system for sodium removal and wash water recovery, as researched by the USDA.

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This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: FDR

TITLE OF PROJECT: Disposal of Rum Distillery Wastes

GRANTEE OR CONTRACTOR:
Agricultural Experiment Station
University of Puerto Rico
Rio Piedras, Puerto Rico

EPA PROJECT OFFICER:
Mr. Edmond Lomasney
Region IV, EPA
1421 Peachtree Street, N.E.
Atlanta, Georgia 30309

Project Site: Rio Piedras, Puerto Rico

DESCRIPTION OF PROJECT

Award Date: July 1968

Project Cost: $85,400

Completion Date: July 1971

Federal Cost: $46,252

Summary:

The objective of this project was to develop the best method for the disposal of rum distillery waste. The waste was then to be subjected to detailed analysis and then was to undergo pilot treatment by means of anaerobic digestion, activated sludge, and lagooning. These processes were then to be evaluated in terms of efficiency and economics.

NOTE: THIS PROJECT WAS DISCONTINUED.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: FDS

TITLE OF PROJECT: Elimination of Water Pollution by Packing House Animal Paunch and Blood

GRANTEE OR CONTRACTOR:

Beefland International, Inc.
Council Bluffs, Iowa 51501

EPA PROJECT OFFICER:

Mr. Otmar Olson
Region VII, EPA
911 Walnut Street
Kansas City, Missouri 64106

Project Site: Council Bluffs, Iowa

DESCRIPTION OF PROJECT

Award Date: November 1969

Project Cost: $367,870

Completion Date: November 1971

Federal Cost: $161,398

Summary:

The operation of two dehydrating machines, for the drying of cattle whole blood as well as paunch contents (rumen), at the Beefland International, Inc., slaughtering plant at Council Bluffs, Iowa, was studied.

The BOD_5 and COD of the blood and rumen were established. The mean BOD_5 of the whole blood and rumen was determined as 156,500 ppm and 50,200 ppm, respectively. The mean COD of the blood and rumen was established as 218,300 ppm and 177,300 ppm, respectively.

The economics of the drying process in costs per ton of dried product per 1000 lbs live kill weight (LWK), and per animal were determined. The dehydrating costs per ton of dehydrated product were found to be $43.75/ton for blood and $38.46/ton for rumen. The average cost (blood and rumen) was $40.93/ton.

Laboratory studies were carried out on the dried whole blood and rumen with a view toward their actual and potential use as legally accepted feeds or feed additives. Percent moisture, protein, fat, carbohydrate, and other analyses of the dried products are reported.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: FJK

TITLE OF PROJECT: Acid Emulsion Breaking-Activated Sludge for Bakery Waste

GRANTEE OR CONTRACTOR:

Ebinger Baking Co.
2290 Bedford Avenue
Brooklyn, New York 11226

EPA PROJECT OFFICER:

Mr. Charles H. Ris
Industrial Pollution Control
Division (RD-679), EPA
Washington, D. C. 20460

Project Site: Melville, New York

DESCRIPTION OF PROJECT

Award Date: June 1970

Project Cost: $464,860

Completion Date: April 1972

Federal Cost: $129,729

Summary:

A waste treatment system was to be designed, constructed, operated, and evaluated for a 80,000-gpd effluent from a sweet-goods bakery. Acid emulsion breaking was to be used as a pretreatment step to destabilize the fats and oils in the waste, and activated sludge was to be used as the secondary treatment process. A multimedia filtration system was then to be used to render the effluent suitable for subsurface leeching.

NOTE: THIS PROJECT WAS DISCONTINUED.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: FLL

TITLE OF PROJECT: Activated Sludge - Bio Disc Treatment of Distillery Wastes

GRANTEE OR CONTRACTOR:

American Distilling Co.
South Front Street
Pekin, Illinois 61554

EPA PROJECT OFFICER:

Mr. Dennis W. Taylor
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Pekin, Illinois

DESCRIPTION OF PROJECT

Award Date: June 1970

Completion Date: April 1973

Project Cost: $1,078,000

Federal Cost: $384,588

Summary:

Plant scale evaluation of activated sludge and Bio-Disc treatment of distillery wastewater has been conducted over a period of more than one year at Pekin, Illinois. The activated sludge process consistently provided in excess of 90% removal of BOD_5, even at loadings greater than the treatment plant design levels. The Bio-Disc process had to be down-rated from the original design basis in order to approach a comparable removal efficiency. Of the two systems evaluated, the activated sludge process was the more desirable from standpoints of economics, treatment performance, and ability to handle shock loads.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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This sheet briefly describes an R & D project Section 104 or 105 of the
Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: FMF

TITLE OF PROJECT: Evaluation of the Rotating Biological Surface System on Meat Packing Wastes

GRANTEE OR CONTRACTOR:

Iowa Beef Packers, Inc.
Dakota City, Nebraska 68731

EPA PROJECT OFFICER:

Mr. William Garner
Region VII, EPA
911 Walnut Street
Kansas City, Missouri 64106

Project Site: Dakota City, Nebraska

DESCRIPTION OF PROJECT

Award Date: June 1970

Project Cost: $559,230

Completion Date: May 1972

Federal Cost: $195,751

Summary:

This project was to consist of building and evaluating a 3-mgd anaerobic-aerobic system where the aerobic treatment was to be achieved by the use of 8 two-stage rotating biological surface units with a total surface area of 500,000 sq ft.

NOTE: THIS PROJECT WAS DISCONTINUED.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: FQE

TITLE OF PROJECT: Dry Caustic Peeling of Tree Fruit to Reduce Liquid Waste Volume and Strength

GRANTEE OR CONTRACTOR:

National Canners Association
1950 Sixth Street
Berkeley, California 94710

EPA PROJECT OFFICER:

Mr. Kenneth Dostal
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Berkeley, California

DESCRIPTION OF PROJECT

Award Date: March 1970

Completion Date: December 1970

Project Cost: $19,539

Federal Cost: $17,538

Summary:

The peeling of apricots, peaches, and pears was studied with a peel removal unit consisting of a series of spindles holding rotating rubber disks. The peel was removed by a wiping action of the flexible rubber disks on fruit wetted with hot sodium hydroxide solutions. The quality of fruit peeled with the experimental unit was comparable to fruit peeled by conventional chemical peeling; peeling losses were about the same for the experimental unit and the commercial units. The most striking difference between the experimental unit and the commercial units was in fresh water requirements and wastewater volume and strength. The peeling of cling peach halves required one-fifteenth of the fresh rinse water volume of a conventional commercial peeler. The wastewater generated by the experimental peeling of peaches had about one-third of the chemical oxygen demand and suspended solid content of the wastewater from the commercial peeler. The experimental peel removal unit accomplishes a diversion of potentially water polluting organic material from the wastewater to a peel sludge. The peel sludge has properties which allow it to be handled readily and disposed of as solid residual.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: FRW

TITLE OF PROJECT: Water and Waste Management in Sweet Potato Processing

GRANTEE OR CONTRACTOR:

Tabor City Foods, Inc.
P. O. Box 398
Tabor City, North Carolina 28463

EPA PROJECT OFFICER:

Mr. Harold Thompson
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Tabor City, North Carolina

DESCRIPTION OF PROJECT

Award Date: April 1971

Completion Date: January 1973

Project Cost: $305,886

Federal Cost: $133,833

Summary:

The purpose of this project was to make changes in plant equipment and operations for demonstrating effective in-plant control of both water use and waste discharge and to demonstrate effective pretreatment of wastes from sweet potato processing. The project encompasses waste abatement and water use throughout the plant from water intake through pretreatment. The specific objectives were:

1. Installation and/or modification of a dry caustic peeling process and demonstrate its operation for water and waste reduction.
2. Installation and demonstration pretreatment and conditioning of wastewaters in the reduction of waste loads.
3. Determination of the economic implications of the water and waste reduction techniques demonstrated.
4. Formulation of guides for the management of water and waterborne wastes and the pretreatment of liquid wastes.

NOTE: THIS PROJECT WAS DISCONTINUED.

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: FTC

TITLE OF PROJECT: State-of-the-Art Study for Pollution Control in the Beverage Industry

GRANTEE OR CONTRACTOR:

Resource Engineering Associates
Division of Environmental Research
and Applications, Inc.
24 Danbury Road
Wilton, Connecticut 06897

EPA PROJECT OFFICER:

Mr. Harold G. Keeler
EPA, Industrial Pollution
Control Division (RD-679)
Washington, D. C. 20460

Project Site: Wilton, Connecticut

DESCRIPTION OF PROJECT

Award Date: September 1970

Project Cost: $53,664

Completion Date: September 1971

Federal Cost: $53,664

Summary:

The objective of this study was to be the development of a state-of-the-art document on water pollution abatement technology and research for the beverage industry.

NOTE: THIS PROJECT WAS DISCONTINUED.

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: FUR

TITLE OF PROJECT: Membrane Separation of Soybean Whey for Product Recovery and Waste Treatment

GRANTEE OR CONTRACTOR:

Central Soya Company, Inc.
1825 North Laramie Avenue
Chicago, Illinois 60639

EPA PROJECT OFFICER:

Mr. Clifford Risley
Region V, EPA
1 North Wacker Drive
Chicago, Illinois 60606

Project Site: Chicago, Illinois

DESCRIPTION OF PROJECT

Award Date: September 1970

Project Cost: $143,750

Completion Date: July 1972

Federal Cost: $86,825

Summary:

During this 16-month project, the applicant will design, construct, and operate a pilot-scale membrane separation process for the treatment and product recovery from a soybean whey waste discharge. The pilot-scale facility will process 700 gallons per day of soybean whey and the operational data from the project will be used to establish the design scale-up factors and economic feasibility of a commercial size facility. The treatment and recovery system will consist of a two-stage membrane separation unit followed by an evaporation process. The system will be designed to handle a soybean whey discharge which in its diluted condition has a 4700 mg/1 BOD, a 10,100 mg/1 COD, a pH of 4.6 and a solids concentration of 15,000 mg/1.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: GPP

TITLE OF PROJECT: Small Meatpacker Waste Treatment Systems

GRANTEE OR CONTRACTOR:

W. E. Reeves Packinghouse
P. O. Box 477
Ada, Oklahoma 74820

EPA PROJECT OFFICER:

Mr. Jack L. Witherow
RSKERL, EPA
P. O. Box 1198
Ada, Oklahoma 74820

Project Site: Ada, Oklahoma

DESCRIPTION OF PROJECT

Award Date: November 1970

Project Cost: $51,185

Completion Date: March 1975

Federal Cost: $35,829

Summary:

The objectives of this project are to evaluate various biological systems for the treatment of small meat packing house waste flows. The specific objectives will include: (1) Demonstration to small meatpackers of the suitability of the anaerobic-aerobic lagoon system with high BOD removal, simplicity of operation, and minimum capital and maintenance costs; (2) Evaluation of the need for sludge recirculation in anaerobic lagoon and for aeration and sludge retention in the first-stage aerobic lagoon; (3) Determination of the economic and technical advantages of an aerated-aerobic lagoon system versus the anaerobic-aerobic lagoon system; (4) Demonstration to the meatpacking industry of the capability of the spray-runoff soil treatment system to meet future requirements for nitrogen and phosphorus removal in addition to high BOD reduction using the raw wastewaters, the anaerobic lagoon effluent, and the aerobic lagoon effluent. The project data and evaluations of the waste treatment systems will provide the basis for the development of a manual for small meatpacking house wastewater treatment.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: HCW

TITLE OF PROJECT: Submerged Combustion Evaporation System for Concentration of Brewery Spent Grain Liquors

GRANTEE OR CONTRACTOR:

Anheuser-Busch, Inc.
721 Pestalozzi Street
St. Louis, Missouri 63118

EPA PROJECT OFFICER:

Mr. Robert Hiller
South Central Regional Office
1402 Elm Street
Dallas, Texas 75202

Project Site: Houston, Texas

DESCRIPTION OF PROJECT

Award Date: September 1971

Project Cost: $498,817

Completion Date: August 1972

Federal Cost: $78,630

Summary:

One of the major waste streams in many breweries is the liquor resulting from the dewatering of spent grains prior to drying. This liquor may account for a third or more of the BOD_5 and suspended solids generated by a typical brewery. Several methods for treating this liquor or reclaiming the organic solids in it were investigated. Initial studies indicated that reclamation was the more desirable approach. A number of evaporators were evaluated to determine which design was most satisfactory for concentrating spent grain liquor. A submerged combustion evaporator appeared to have several distinct advantages, and pilot scale tests bore this out. - A full-scale unit was installed at the Houston Brewery of Anheuser-Busch, Inc., in 1970. This evaporator was modified several times in an effort to overcome failures of the burner downcomers brought about by high temperatures. Before a final solution to these problems could be demonstrated, the project was terminated due to changed conditions regarding fuel supplies and prices. Increased costs for oil and gas, coupled with the poor thermal efficiency of the submerged combustion evaporator, indicated that conventional methods of evaporation would be more economical.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: HFY

TITLE OF PROJECT: Dry Caustic Peeling of Clingstone Peaches on a Commercial Scale

GRANTEE OR CONTRACTOR:

Del Monte Corporation
215 Fremont Street
San Francisco, California 94119

EPA PROJECT OFFICER:

Mr. Harold Thompson
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: San Jose, California

DESCRIPTION OF PROJECT

Award Date: April 1971

Project Cost: $71,293

Completion Date: March 1973

Federal Cost: $49,900

Summary:

During the 9-month project period Del Monte Corporation will design, construct, install, and operate a 15 ton per hour "dry caustic" unit on a clingstone peach line at Plant No. 3. Evaluation of this unit will provide a full-scale comparison with conventional peeling operations and substantiate earlier results obtained under Project 12060 FQE. Previous data indicates water reduction from 530 to 35 gallons per ton of peaches processed is possible, as well as reducing COD and suspended solids in the liquid waste from 60 to 18 lbs/ton and 10 to 3 lbs/ton respectively.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: HPC

TITLE OF PROJECT: Pilot-Plant Treatment of Wine Stillage

GRANTEE OR CONTRACTOR:

California Dept. of Agriculture
Wine Advisory Board
717 Market Street
San Francisco, California 94103

EPA PROJECT OFFICER:

Mr. Robert Burm
PNERL, EPA
Corvallis, Oregon

Project Site: Davis, California (Build Unit)
Fresno, California (Run Unit)

DESCRIPTION OF PROJECT

Award Date: July 1971

Completion Date: August 1973

Project Cost: $77,832

Federal Cost: $49,820

Summary:

This project will investigate, on a small pilot-plant scale, the aerobic and anaerobic treatment of California brandy stillage. In addition, direct fermentation of the pomace stream will be investigated to look for the most utilitarian method of removing this wastewater stream. Various grape varieties and their resulting compositional wastewater differences will be investigated theoretically and experimentally. - This project phase has, as its ultimate goal, the development of design criteria and standard treatment costs for anaerobic and aerobic wastewater treatment of brandy stillage.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: HRR

TITLE OF PROJECT: Protein Production from Acid Whey Via Fermentation

GRANTEE OR CONTRACTOR:

Amber Laboratories Division
Milbrew, Incorporated
Juneau, Wisconsin 53030

EPA PROJECT OFFICER:

Mr. Kenneth Dostal
PNERL, EPA
Corvallis, Oregon

Project Site: Juneau, Wisconsin

DESCRIPTION OF PROJECT

Award Date: September 1971

Project Cost: $251,549

Completion Date: July 1972

Federal Cost: $95,490

Summary:

From the operation of a demonstration pilot plant over extended periods of time, it has been shown that yeast may be grown on an acid whey or sweet whey medium in a continuous, deep tank aerated fermentor. Variations in fermentation conditions, strain selection, and medium composition produced cell concentrations of several billion cells per milliliter. By a process of evaporation and spray drying the whole fermented whey mass and the utilization of the evaporator condensate to dilute incoming condensed whey, a high grade, non-toxic, protein feed material may be produced without any effluent streams. Amino acid analyses and protein efficiency ratios are presented for this feed material. - Economic estimates show that while a large capital investment and low cost raw material are required for the commercial feasibility of this fermentation process, it will be competitive with other methods for the manufacture of single cell protein. This whey fermentation is one means of converting large quantities of a potential environmental pollutant into a useful and needed product.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: PAV

TITLE OF PROJECT: Low Water Volume Enzyme Deactivation of Vegetables Before Preservation

GRANTEE OR CONTRACTOR:

National Canners Association
Research Foundation
1133 20th Street, N.W.
Washington, D. C. 20036

EPA PROJECT OFFICER:

Mr. Harold Thompson
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Berkeley, California

DESCRIPTION OF PROJECT

Award Date: April 1971

Completion Date: March 1973

Project Cost: $137,505

Federal Cost: $86,108

Summary:

Four pilot-plant units were operated with asparagus, peas, corn, beans, beets, pumpkin, and spinach to establish the potential for new blanching systems with low wastewater generation. The systems investigated were microwave, hot-gas, steam, and hot-water. Single runs of about one hour duration were made for each commodity with each blanching system. Wastewater volume was measured and samples were analyzed for COD, SS, and pH. The most striking result obtained was the small volume of steam condensate formed hot-gas blanching. Canned samples of vegetable material from each blancher were prepared for quality evaluation after storage. Taste panels showed no significant flavor preference for samples from any individual blanching system. The system used had no significant effect on the vitamin and mineral retention of blanched or canned samples. The oxygen content of canned samples was lowest for hot-gas blanching compared to the other three systems. Estimates of the cost of blanching using commercial-scale units gave (dollars/ton blanched): microwave, 18.47; hot-gas, 3.39: steam, 2.21; and hot-water, 2.36.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: WP-01486-01

TITLE OF PROJECT: Current Practice in Potato Processing Waste Treatment

GRANTEE OR CONTRACTOR:

Department of Civil Engineering
University of Washington
Seattle, Washington 98105

EPA PROJECT OFFICER:

Mr. James Boydston
Pacific Northwest Env. Res.
Laboratory, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Seattle, Washington

DESCRIPTION OF PROJECT

Award Date: June 1968

Project Cost: $19,331

Completion Date: June 1970

Federal Cost: $18,364

Summary:

The continued rapid growth of the potato processing industry represents a corresponding increase in wastewater volume. The final report to this project discusses potato processing, waste treatment, and current and needed research in water quality control in this production field. A brief description is given in the report of general characteristics of the potato and the effects and importance of cultural and environmental conditions on potato processing. General descriptions of the production processes have been included and the literature has been extensively reviewed to present current and proposed waste treatment technology. The most urgent research needs are discussed together with suggested methods for meeting these needs.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: WPD 93-04-68

TITLE OF PROJECT: Anaerobic-Aerobic Sugar Beet Waste Treatment

GRANTEE OR CONTRACTOR:

Beet Sugar Development Foundation
156 South College Avenue
P. O. Box 538
Fort Collins, Colorado 80521

Project Site: Tracy, California

EPA PROJECT OFFICER:

Mr. Ralph Scott
Pacific Northwest Environmental
Research Laboratory, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

DESCRIPTION OF PROJECT

Award Date: June 1968

Completion Date: July 1969

Project Cost: $34,550 (4th yr)

Federal Cost: $25,300 (4th yr)

Summary:

Sugarbeet factory transport (flume) water wastes were treated in pilot-sized anaerobic, facultative and aerobic ponds to remove BOD. Physical, chemical, and mechanical data were collected on the performance of each pond which showed cause for abandoning the facultative phase of treating. BOD removal in the anaerobic pond was a linear function of the BOD loading and up to a loading of 2,000 pounds of BOD per acre per day, 80% removal was accomplished with the assistance of mechanical aeration. The algae (aerobic), pond was mixed by means of four 12,000 gpm propeller pumps. Some unseparated algae pond effluent was recycled to the anaerobic pond providing organic nitrogen, phosphorus and "seed" for the microbial transformations. Additional nutrients were required for maximum performance. The system was effective in converting soluble BOD to insoluble BOD. The report contains 42 figures and 11 tables which show potential commercial application of certain segments of the processes investigated.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: WPRD 133-01-68

TITLE OF PROJECT: Activated Sludge Treatment of Chrome Tannery Wastes

GRANTEE OR CONTRACTOR:

A. C. Lawrence Leather Company
Division of Swift & Company
10-18 Sawyer Street
Peabody, Massachusetts

EPA PROJECT OFFICER:

Mr. George Webster
Industrial Pollution Control
Division (RD-679), EPA
Washington, D. C. 20460

Project Site: South Paris, Maine

DESCRIPTION OF PROJECT

Award Date: August 1967

Project Cost: $124,593

Completion Date: September 1971

Federal Cost: $ 87,215

Summary:

A waste treatment process was developed and tested, in pilot-plant scale, for the treatment of the tannery wastes in combination with municipal sewage. The process consisted of the following steps in the order employed; equalizing and mixing of the alkaline and acid wastes; primary sedimentation; carbonation followed by upflow sedimentation; addition of screened municipal sewage; activated sludge treatment and secondary sedimentation of the mixed wastes; and chlorination. The sludges resulting from the treatment of the wastes and sewage were dewatered by centrifuge and were found to be suitable for burial. Design factors for the various steps of the process were developed and are presented in the attached report. Studies were made of the fundamental systems and reactions which form the basis for the processes employed in the pilot plant.

The results of the pilot-plant investigation indicate that by use of the methods recommended, which are basically conventional sewage treatment unit processes, mixtures of chrome tannery wastes and municipal sewage can be treated successfully.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: WPD 185-02-68

TITLE OF PROJECT: Treatment of Sole Leather Vegetable Tannery Wastes

GRANTEE OR CONTRACTOR:

Dept. of Environmental Health Engineering
University of Cincinnati
Cincinnati, Ohio

EPA PROJECT OFFICER:

Mr. George Webster
Industrial Pollution Control
Division (RD-679), EPA
Washington, D. C. 20460

Project Site: Marlinton, West Virginia

DESCRIPTION OF PROJECT

Award Date: May 1968

Completion Date: September 1970

Project Cost: $70,825 (2nd yr)

Federal Cost: $29,325 (2nd yr)

Summary:

Four major studies, two pilot-scale and two full-scale, were carried out during the period of this investigation. The basic objective of the studies was to find a technically feasible and economical procedure for treating the wastes from a sole leather vegetable tannery. A detailed identification of the sources of all wastes as well as a comprehensive characterization of each waste fraction was made for the International Shoe Company Tannery located at Marlinton, West Virginia.

The lime bearing wastes from the beamhouse were screened, treated with polyelectrolytes, and then clarified. The lime sludge was used for landfill. The system was designed to treat one million gallons of waste per week. BOD was reduced 85-95% and the suspended cost of the total system was approximately $40,000 and it is estimated that the operating cost will be about $15,000 per year or 7 cents per hide processed.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: WPRD 38-01-67

TITLE OF PROJECT: Treatment of Citrus Processing Wastes

GRANTEE OR CONTRACTOR:

Minute Maid Company
Orlando, Florida

EPA PROJECT OFFICER:

Dr. David Hill
SERL, EPA
College Station Road
Athens, Georgia 30601

Project Site: Leesburg, Florida and Auburndale, Florida

DESCRIPTION OF PROJECT

Award Date: December 1966

Project Cost: $550,000

Completion Date: December 1969

Federal Cost: $350,000

Summary:

Plant-scale studies were performed in this project to determine operational and treatment parameters for citrus processing wastewaters. Part I of the final report discusses treatment of concentrated citrus processing wastewaters combined with domestic sewage using a modified activated sludge process; namely, extended aeration. Part II discusses treatment of weak processing wastewaters using a system which functioned as an aerated lagoon. - Extended aeration yielded 94 to 95 percent BOD removal; however, difficulties concerning positive control of the treatment process were encountered. Variations in mixed liquor suspended solids concentrations, sludge volume indices, sludge recirculation rates, and hydraulic loading were considered principal causes adversely affecting the treatment process. Excess sludge buildup amounted to approximately 0.5 pounds per pound of influent BOD and sludge wastage accounted for the greater portion of overall nutrient removal from the system. The aerated lagoon process afforded 91% BOD removal from daily average hydraulic and organic loadings were controlled at 6.4 mgd and 6770 lbs, respectively (detention time 7.9 days). Ecological studies indicated that BOD:N:P ratios of the order of 150:5:1 were adequate for supporting the population of organisms required for effective bio-oxidation. Organic nutrient removal studies using hyacinths indicated a minimum of 5 days detention would be required to afford substantial nutrient reduction.

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: WPRD 151-01-68

TITLE OF PROJECT: Waste Reduction in Food Canning Operations

GRANTEE OR CONTRACTOR:

National Canners Association
Research Foundation
1133 20th Street, N.W.
Washington, D. C. 20036

Project Site: San Jose, California

EPA PROJECT OFFICER:

Mr. William Pierce
Region IX, EPA
760 Market Street
San Francisco, California
94102

DESCRIPTION OF PROJECT

Award Date: February 1968

Completion Date: April 1970

Project Cost: $55,120

Federal Cost: $33,330

Summary:

In this project, various methods of reducing wastes in food canning operations were examined. These methods included trickling filters, pH control, an air flotation system, and screens. - A high-rate trickling filter was constructed, utilizing light weight, self-supporting plastic packing medium that provided large uniform surface area for microbial growth. The effects of hydraulic loading and nutrient addition on soluble BOD removal from fruit wastewater were investigated. To examine the effects of pH control, fruit pumping water was acidified with citric acid and controlled at pH 4.0 or below to inhibit bacterial growth and to extend the use of recirculated water. The sanitary condition of the acidified system was equal to or better than a comparable non-acidified system. An air flotation system was evaluated for suspended solids removal efficiency. The influent to recycle ratio was 1:1. In general, the removal efficiency decreased as the hydraulic rate increased. - A single-deck and a double-deck circular vibrating screen were evaluated for solids separation. The maximum capacity of the single (20 mesh) deck was 1000 gpm. With a 64-mesh, capacity was reduced to 300-400 gpm.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 800250

TITLE OF PROJECT: Continuous Hot Air Blanching of Vegetables

GRANTEE OR CONTRACTOR:

National Canners Association
Research Foundation
1133 20th Street N.W.
Washington, D. C. 20036

EPA PROJECT OFFICER:

Mr. Kenneth Dostal
PNERL, EPA
200 S. W. 35th Street
Corvallis, Oregon 97330

Project Site: Stockton, California and Salem, Oregon

DESCRIPTION OF PROJECT

Award Date: June 1972

Project Cost: $71,424

Completion Date: September 1973

Federal Cost: $49,892

Summary:

The primary objective of this project is to demonstrate the technical and economic feasibility of the hot air blanching process in the vegetable preserving industry for substantially reducing a major source of pollution and as a means of water conservation. Conventional hot water blanching is employed to inactivate enzymes prior to canning but generates large volumes of wastewater with high BOD and solids content. The hot air blanching process which does not use water, inactivates enzymes by heat treatment with combusted gas in a plenum chamber producing only small volumes of steam condensate. - Pilot scale hot air blanching equipment will be modified to provide continuous operation at two processing facilities on five major volume commodities (spinach, green peas, corn, green beans, and beets). Optimum operating conditions and costs will be determined from consecutive 8-hour runs. Product quality evaluations will be conducted and compared with conventional blanched products. In addition the volume of condensate will be measured and wastewater characteristics (COD, pH, SS) determined.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 800746 (HVQ)

TITLE OF PROJECT: Utilization of Paunch Manure, as a By-Product Feed for Channel Catfish, and Its Effects on Water Quality

GRANTEE OR CONTRACTOR:

Oklahoma State University
Stillwater, Oklahoma 74074

EPA PROJECT OFFICER:

Mr. John Witherow
SERL, EPA
Ada, Oklahoma

Project Site: Stillwater, Oklahoma

DESCRIPTION OF PROJECT

Award Date: October 1971

Project Cost: $30,497

Completion Date: June 1973

Federal Cost: $26,600

Summary:

Part A of this report examines the feasibility of using dried paunch at 10, 20, and 30% levels in feed for pond-rearing yearling channel catfish to market-size, and at a 10% level for cage-culture of yearling catfish. Part B describes the effects of fish ponds. In all, one physical, one bacteriological, and fifteen chemical parameters were measured. - Regardless of feed type, pond-reared fish grew faster than the cage-reared fish. There was no significant difference in final weights attained by fish given standard, and 10 and 20% paunch feeds but fish given 30% paunch were significantly smaller. Feed costs per kg of catfish produced using the standard commercial sinking feed and sinking feed containing 10% paunch were essentially equal, but feed costs for making sinking feed with 10 and 20% paunch were greater than the standard. The costs of making a floating feed containing 10% paunch for raceway or cage culture of channel catfish were uneconomical. Neither the pond culture nor the cage culture caused deterioration in water quality in any of the ponds to any appreciable degree in one growing season of 24 weeks, and there was no significant difference in water quality in general between the ponds in which commercial feeds were used and those in which paunch-containing feeds were used--this was true in both pond and cage cultures.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 800747

TITLE OF PROJECT: Plant for Commercial Production Protein by Fermentation of Acid and/or Sweet Whey

GRANTEE OR CONTRACTOR:

Milbrew, Inc.
Amber Laboratories Div.
Juneau, Wisconsin 53039

EPA PROJECT OFFICER:

Mr. M. W. Cochrane
PNERL, EPA
Corvallis, Oregon

Project Site: Juneau, Wisconsin

DESCRIPTION OF PROJECT

Award Date: June 1973

Project Cost: $4,193,950

Completion Date: April 1975

Federal Cost: $170,000

Summary:

The objective of this project is to scale-up to commercial production the processes developed under a previous pilot plant study (EPA Project S 800747) for the production of protein by fermentation of acid and/or sweet whey. Continuous fermentation in closed, deep-tank, aerated vessels, with capacities up to 15,000 gallons, will convert the lactose in the whey to a high protein feed product using Saccharomyces fragilis. By using a combination of evaporation and drying the whole fermented mass, and using evaporator condensate to dilute incoming condensed whey, no effluent streams will be produced. The operation of the demonstration plant will be for a 12-month period after completion of construction and start-up and should be completed by April, 1975.

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 800904

TITLE OF PROJECT: Shrimp Canning Waste Treatment Study

GRANTEE OR CONTRACTOR:

American Shrimp Canners Assoc.
P. O. Box 50774
New Orleans, Louisiana 70150

EPA PROJECT OFFICER:

Mr. Robert L. Hiller
Region XI, EPA
Dallas, Texas

Project Site: Westwego, Louisiana

DESCRIPTION OF PROJECT

Award Date: May 1972

Completion Date: November 1973

Project Cost: $61,943

Federal Cost: $43,714

Summary:

Wastewater surveys were performed at several Gulf shrimp canneries over a period of three canning seasons. Water used for each process within the plant was metered and the wastewater was tested for biological, chemical, and physical characteristics. Pilot screening tests were made over two canning seasons. Tangential, rotary , and vibrating screens were evaluated. A 272 cu m/day (50 gpm) dissolved air flotation pilot plant with chemical addition and pH control was tested at the study plant over two canning seasons. A pilot basket centrifuge was evaluated for sludge dewatering. The study demonstrated that: (1) The waste poundage discharged per pound of raw shrimp processed is similar in most Gulf shrimp canning plants: (2) Screening removal of heads and shells can be performed efficiently and with few operational problems: and (3) Air flotation showed promise as a wastewater treatment method. When performing properly, treatment efficiencies were good, however, the operation was sensitive and treatment efficiencies that can be expected on a plant scale remain to be demonstrated.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 800930

TITLE OF PROJECT: Recycling of Water in Poultry Processing Plants

GRANTEE OR CONTRACTOR:
Pacific Egg and Poultry Assoc.
5420 Jefferson Boulevard
Los Angeles, California 90016

EPA PROJECT OFFICER:
Mr. Vern Tenney
Region IX, EPA
San Francisco, California

Project Site: Livingston and Menlo Park, California

DESCRIPTION OF PROJECT

Award Date: June 1972

Project Cost: $150,550

Completion Date: June 1973

Federal Cost: $99,206

Summary:

The primary objective of this project is to conduct pilot scale studies to recycle chiller wastewater at a rate of 500 gallons per minute following filtration and sterilization steps. The recycling system consists of a travelling screen to remove coarse solids, a cyclonic desludger for solids removal of particle sizes 100 Mu or larger, and an ultraviolet unit for sterilization. The latters irradiation will impart a minimum dosage of 30,000 micro watts/sq cm to the chiller water stream, well above the minimum to eliminate a major portion of viable pathogens and viruses. An analysis of BOD, total solids, oil and grease, iron, chlorides, total plate count, coliform count, salmonella incidence, poultry virus incidence, temperature, and adsorption at 253.7 nm, will be conducted at appropriate time intervals and locations in the continuous chiller system. The principal site of the study will be at Foster Farms Inc., located in Livingston, California. This plant processes 180,000 birds per day in a two-shift, 15 hours, operation.

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 800935

TITLE OF PROJECT: Rum Distillery Waste Treatment by Anaerobic Digestion

GRANTEE OR CONTRACTOR:

Bacardi Corporation
GPO Box 3549
San Juan, Puerto Rico 00936

EPA PROJECT OFFICER:

Mr. George Keeler
Industrial Pollution Control
Division (RD-679), EPA
Washington, D. C. 20460

Project Site: San Juan, Puerto Rico

DESCRIPTION OF PROJECT

Award Date: April 1972

Completion Date: May 1974

Project Cost: $128,725

Federal Cost: $89,758

Summary:

An investigation was made of the feasibility of rum distillery slops treatment by the anaerobic contact process. Both bench and pilot-scale experimental studies were conducted to permit determination of the Monod kinetic constants for the anaerobic treatment of neutralized, phosphorus-amended rum slops. The settling characteristics of mixed liquor suspended solids from the anaerobic contact unit were determined using a moderately cationic, high molecular weight polymer as a coagulant aid. The experimental results, developed with the bench and pilot units, were used to define a process flow sheet, detailed design criteria, and an economic analysis for full-scale applications of rum distillery slops treatment, at design analysis for full-scale applications of rum distillery slops treatment, at design capacities varying from 190 cu m/day (50,000 gal/day) to 1,140 cu m/day (300,000 gal/day).

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 801007

TITLE OF PROJECT: Seafoods Processing Waste Water Characterization

GRANTEE OR CONTRACTOR:

Oregon State University
Dept. of Food Science and
Technology
Corvallis, Oregon 97331

EPA PROJECT OFFICER:

Mr. Kenneth Dostal
Pacific Northwest Environmental
Research Lab, EPA
Corvallis, Oregon 97330

Project Site: Corvallis, Oregon

DESCRIPTION OF PROJECT

Award Date: September, 1971

Completion Date: June, 1973

Project Cost: $81,343

Federal Cost: $64,817

Summary:

The Oregon State University Seafoods Laboratory proposes to employ a mobile wastewater analytical laboratory on its premises in Astoria, Oregon, to monitor the wastes produced by six different seafoods processing plants. The study will include categorization of tuna, bottom fish, crab, clams, shrimp, salmon, and by-products. - Using methods proven in previous laboratory work and utilizing equipment already on hand, they will (with flow-proportioned composite samples whenever possible) monitor on site: 1) flow, 2) temperature, 3) dissolved oxygen, and 4) pH. After passage through a 20 mesh screen, the composite samples would be analyzed in the mobile facility for the following constituents: 5) total solids, 6) dissolved solids, 7) volatile solids, 8) settleable solids, 9) suspended solids, 10) chemical oxygen demand, 11) 5-day biochemical oxygen demand (at intervals), 12) ultimate biochemical oxygen demand (at intervals), and 13) oil and grease. In addition, a portion of each composite sample would be preserved and shipped to the O.S.U. Department of Food Science Waste Management Laboratory in Corvallis, Oregon, for complete nitrogen and phosphorus analysis. - Solid waste magnitudes will also be monitored. All results will be expressed in terms of production volume (e.g. lbs BOD_5/ton raw product).

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 801037

TITLE OF PROJECT: Leather Tannery Waste Management Through Process Change, Reuse and Pretreatment

GRANTEE OR CONTRACTOR:

Pfister & Vogel Tanning Co., Inc.
1531 No. Water Street
P. O. Box 745
Milwaukee, Wisconsin 53201

EPA PROJECT OFFICER:

Mr. William Banks
Region VII, EPA
1735 Baltimore, Room 249
Kansas City, Missouri 64106

Project Site: Milwaukee, Wisconsin

DESCRIPTION OF PROJECT

Award Date: March 1972

Project Cost: $275,905

Completion Date: March 1974

Federal Cost: $99,842

Summary:

This project will demonstrate that it is technically and economically feasible to achieve major reductions in the pollution load discharge from a large side leather tannery through process changes, reuse, and recovery techniques and pretreatment methods. Conventional batch type tanning operations will be replaced by newly developed hide processing machines in which the hide is not removed from the unit until the tanning step has been completed. This process change will permit a waste volume reduction of approximately 50%. Additional major waste reductions will result from the recovery of processing chemicals and the reuse and pretreatment of individual waste streams. Recovery of soluble proteins extracted from the hides will be investigated. Adequate sampling will be performed to achieve parameter weight balances throughout multiple process cycles to characterize the tannery effluent.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 801432

TITLE OF PROJECT: Treat Wastewater from Citrus Processing Industry

GRANTEE OR CONTRACTOR:

Winter Garden Citrus Products Co-Op
Gainesville, Florida

EPA PROJECT OFFICER:

Mr. H. W. Thompson
PNERL, EPA
Corvallis, Oregon

Project Site: Gainesville, Florida

DESCRIPTION OF PROJECT

Award Date: February 1973

Completion Date: August 1974

Project Cost: $49,500

Federal Cost: $45,500

Summary:

Waste activated sludge will be gravity thickened, concentrated in a centrifuge, dried in a kiln and tested as an animal feed supplement in a series of chicken feeding tests.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 801484

TITLE OF PROJECT: Evaluation of a New Blanching Process (IQB) for Waste Water Abatement in Canning Vegetables

GRANTEE OR CONTRACTOR:
University of Wisconsin
Department of Food Science
Madison, Wisconsin 53706

EPA PROJECT OFFICER:
Mr. Harold W. Thompson
PNERL, EPA
Corvallis, Oregon

Project Site: Madison, Wisconsin

DESCRIPTION OF PROJECT

Award Date: September 1972

Project Cost: $16,324

Completion Date: December 1973

Federal Cost: $15,324

Summary:

A study on the efficacy of a new blanching system, Individual Quick Blanch (IQB), as applied to vegetables prior to canning was conducted. Peas, corn, lima beans, green beans, potatoes, carrots, and beets were adequately blanched by IQB. Compared to deep bed steam blanching or pipe blanching, IQB generally resulted in a significant reduction in effluent. Slight drying of the vegetables before IQB reduced effluent even more; however, product quality was adversely affected in most cases. It was demonstrated that the IQB process can significantly reduce effluent volume and BOD generation in the blanching operation while adequately fulfilling the objectives of blanching. Recommendations for commercial development of IQB are given.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 801684

TITLE OF PROJECT: Effluent Guidelines for Specialty Food Industry

GRANTEE OR CONTRACTOR:

American Frozen Foods Industry
Washington, D. C. 20006

EPA PROJECT OFFICER:

Mr. Harold W. Thompson
PNERL, EPA
Corvallis, Oregon

Project Site: Washington, D. C.

DESCRIPTION OF PROJECT

Award Date: March 1973

Project Cost: $41,391

Completion Date: February 1974

Federal Cost: $28,391

Summary:

AFFI with the full cooperation of its member firms and the National Canners Association wishes to perform a study to accomplish the following objectives: a) Inventory and categorize the Specialty Foods Industry; b) Investigate typical raw waste loads generated per unit of production by major categories of the Specialty Foods Industry; c) Evaluate effectiveness and cost by available liquid waste control technology, both in-house prevention and waste treatment techniques, available to reduce waste loads generated by the Specialty Foods Industry. To accomplish these objectives, a summary of the plan of operation follows: a) From existing data develop an inventory of plants; b) Categorize plants by preparation of ingredients, type of major ingredient, and pack size; all as related to waste generation; c) Make preliminary plant contacts and select 25 diverse plants for field investigation; d) Make field investigations of 25 plants located in the East, Middle West, and West. Investigation is to include sampling and analysis of effluents (approximately 300 samples) plus information required to relate waste generation to production volume and techniques. e) Waste treatment methods and costs will be evaluated for applicability to the wastes identified from this industry; and f) A report suitable for use by the industry and EPA will be prepared.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 801970 (FYG)

TITLE OF PROJECT: Industrial Wastewater Reuse

GRANTEE OR CONTRACTOR:

Maryland State Department of Health
301 W. Preston Street
Baltimore, Maryland 21201

EPA PROJECT OFFICER:

Mr. Kon Barrow
SERL, EPA
College Station Road
Athens, Georgia

Project Site: Sterling Processing Co., Oakland, Maryland

DESCRIPTION OF PROJECT

Award Date: January 1971

Completion Date: July 1973

Project Cost: $211,274

Federal Cost: $185,879

Summary:

The feasibility of reclaiming poultry processing wastewater for reuse where potable water is presently required was studied at the Sterling Processing Corporation plant in Oakland, Maryland, by the Maryland State Department of Health and Mental Hygiene. In addition, extensive study was made of poultry processing raw waste characteristics and proportions of wastes generated during processing and plant cleanup. Effluent characteristics from a two-stage aerated lagoon are reported. - The reclaiming process consisted of a two-stage aerated lagoon wastewater treatment system followed by an advanced water treatment system of microstraining, flocculation, sedimentation, and sand filtration. - The bacteriological, chemical, and physical drinking water standards of the U. S. Public Health Service were consistently met. Samples were composited at random and examined for human enteric virus organisms. All were found to be negative. - The microstraining, flocculation, sedimentation, and sand filtration system had an annual capital and operating cost of $0.71/1000 liters ($0.27/1000 gallons).

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 802174

TITLE OF PROJECT: Egg Breaking and Processing Wastes

GRANTEE OR CONTRACTOR:

Cornell University
N.Y. State College of Agriculture
and Life Sciences
Ithaca, New York 14850

EPA PROJECT OFFICER:

Mr. J. L. Witherow
PNERL, EPA
Corvallis, Oregon

Project Site: Ithaca, New York

DESCRIPTION OF PROJECT

Award Date: February 1973

Completion Date: June 1974

Project Cost: $66,782

Federal Cost: $43,990

Summary:

This project intends to determine the magnitude of the shell egg and egg breaking and processing waste problem on a national and regional basis and to indicate waste management methods that are applicable to these wastes. The objectives of the project are: 1) Define the size of the industries and future growth trends: 2) Characterize typical wastes: 3) Identify opportunities for in-plant waste reduction and water reuse; and 4) Through treatability studies develop feasible treatment alternatives for separate waste treatment as well as joint municipal treatment.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 802253

TITLE OF PROJECT: Protein Recovery from Meat Packing Effluent

GRANTEE OR CONTRACTOR:

Armour and Co.
Armour Food Co., Fresh Meats Division
Phoenix, Arizona 85077

EPA PROJECT OFFICER:

Mr. J. L. Witherow
PNERL, EPA
Corvallis, Oregon

Project Site: Nampa, Idaho

DESCRIPTION OF PROJECT

Award Date: March 1973

Project Cost: $444,898

Completion Date: November 1975

Federal Cost: $140,000

Summary:

This project will demonstrate both the technical and economic feasibility of operating a plant scale process (thereafter called the LSA Process) to precipitate and recover proteinaceous nitrogen from meat packing plant wastewater in a manner that results in significant pollution reduction and in recovery of a salable by-product that presents no ultimate disposal problems. Dissolved-air flotation will be used in conjunction with addition of lignosulfonic acid to recover the proteinaceous matter.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 802420

TITLE OF PROJECT: Ecostatic Cane Processing System

GRANTEE OR CONTRACTOR:

C. Brewer and Co., Lmt.
Hilo Coast Processing Co.
Pepeekeo, Hawaii 96783

EPA PROJECT OFFICER:

Mr. Harold W. Thompson
NERC, EPA
Corvallis, Oregon

Project Site: Pepeekeo, Hawaii

DESCRIPTION OF PROJECT

Award Date: June 1973

Project Cost: $7,387,883

Completion Date: January 1976

Federal Cost: $479,000

Summary:

Full-scale demonstration of sugar cane harvesting and processing with water reuse and solid waste recovery which will result in major reductions in wastes discharged, provide more efficient recovery of raw sugar, and provide an electrical power supply. Soil entrainment in the cane will be reduced by modified methods of harvesting and partial cleaning in the field followed by dry cleaning at the plant. Final washing will utilize sugar juice which will be fully recovered. Bagasse and cleaned trash (recycled water) will be burned for power generation.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 802833

TITLE OF PROJECT: Characterization and Reduction of Specific Wastewaters from In-Plant Hog Processing Units of the Meat Industry

GRANTEE OR CONTRACTOR:

University of Wisconsin
750 University Avenue
Madison, Wisconsin 53706

EPA PROJECT OFFICER:

Mr. Jack L. Witherow
PNERL, EPA
Corvallis, Oregon

Project Site: Madison, Wisconsin

DESCRIPTION OF PROJECT

Award Date: March 1974

Completion Date: August 1975

Project Cost: $111,962

Federal Cost: $76,106

Summary:

The project is to characterize wastewater from critical unit operations in hog slaughtering and associated cleaning, processes, and to develop and demonstrate methods and equipment for reduction of the flow and waste load from these unit operations.

Four processes which are known major contributors to the waste load are to be studied. These are 1) Removal and recovery of blood: 2) Removal, processing, and disposal of hair; 3) Processing of the hog carcass; and 4) Processing of the intestinal tract.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 802958

TITLE OF PROJECT: Minimization of Water Use in Leafy Vegetable Washers

GRANTEE OR CONTRACTOR:

Dulaney Foods Inc.
Eymore, Virginia 23350

EPA PROJECT OFFICER:

Mr. James A. Santroch
PNERL, EPA
Corvallis, Oregon

Project Site: Eymore, Virginia

DESCRIPTION OF PROJECT

Award Date: May 1974

Completion Date: February 1976

Project Cost: $75,545

Federal Cost: $52,882

Summary:

A full-scale experimental leafy green vegetable washer will be installed in a commercial processing line. The wastewater from each unit process in this line and from each unit process in a line with conventional washers will be characterized and compared. The quality of experimentally and conventionally washed leafy greens will be monitored and compared. Eighty hours of spinach processing, eighty hours of broccoli processing, and eighty hours of processing of other leafy greens will be monitored.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 803251

TITLE OF PROJECT: Tomato Cleaning and Water Recycle

GRANTEE OR CONTRACTOR:

National Canners Association
1133 20th Street N. W.
Washington, D. C. 20036

EPA PROJECT OFFICER:

Mr. Harold W. Thompson
PNERL, EPA
Corvallis, Oregon

Project Site: Berkeley, California

DESCRIPTION OF PROJECT

Award Date: July 1974

Completion Date: March 1975

Project Cost: $124,465

Federal Cost: $93,296

Summary:

This study will demonstrate low water use cleaning of tomatoes and recycle of the dump tank (tomato unloading water cushion) water. Cleaning will be by flexible spinning rubber disc and a small amount of water. Water use for cleaning should be reduced from the present 700 gal/ton to 6 gal/ton. In combination with the recycle system the water use for receiving and cleaning should be reduced from 930 gal/ton to 120 gal/ton.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 803280

TITLE OF PROJECT: Reuse of Treated Fruit Processing Wastewater Within a Cannery

GRANTEE OR CONTRACTOR:
Snokist Growers
2506 Terrace Heights Road
Yakima, Washington 98901

EPA PROJECT OFFICER:
Mr. Harold Thompson
PNERL, EPA
Corvallis, Oregon

Project Site: Yakima, Washington

DESCRIPTION OF PROJECT

Award Date: July 1974

Completion Date: July 1975

Project Cost: $563,000

Federal Cost: $249,500

Summary:

This study will evaluate the feasibility of reclaiming end-of-pipe process wastewater for reuse within a fruit cannery. Reuse of the reclaimed water will be evaluated for: equipment and floor cleanup, initial product cleaning and conveying, steam production for use in cooking, blanching, exhausting, retorting and cleaning, and direct contact can cooling. Product quality will be monitored throughout the study.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 803301

TITLE OF PROJECT: Utilization of Cheese Whey for Wine Production

GRANTEE OR CONTRACTOR:

Oregon State University
Corvallis, Oregon 97331

EPA PROJECT OFFICER:

Mr. Max W. Cochrane
PNERL, EPA
Corvallis, Oregon

Project Site: Corvallis, Oregon

DESCRIPTION OF PROJECT

Award Date: July 1974

Completion Date: October 1975

Project Cost: $38,995

Federal Cost: $37,045

Summary:

This project will provide evaluation of technical and economical feasibility of producing alcoholic beverages for human consumption from fermentation of cheese whey. Low energy requirements and almost total utilization of both liquid and solid fractions of whey lend high economic potential to this by-product recovery process.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 803307

TITLE OF PROJECT: Cannery Wastewater Biological Solids Cattle Feeding Project

GRANTEE OR CONTRACTOR:

Snokist Growers
2506 Terrace Heights Road
Yakima, Washington

EPA PROJECT OFFICER:

Mr. James A. Santroch
PNERL, EPA
Corvallis, Oregon

Project Site: Yakima, Washington

DESCRIPTION OF PROJECT

Award Date: July 1974

Project Cost: $88,800

Completion Date: July 1975

Federal Cost: $25,000

Summary:

Waste activated sludge from a fruit cannery wastewater treatment plant will be dewatered by float thickening and centrifuging. To evaluate the sludge as a feedstuff, four feed rations each with a different proportion of sludge, will be fed to 8 steers, in a 68 day metabolism trial and to 24 steers in a 130-160 day finishing trial.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 803312

TITLE OF PROJECT: Integrated IOB Vibratory Blanch Cooler for Reducing Pollution Caused by Blanching of Vegetables

GRANTEE OR CONTRACTOR:

American Frozen Food Institute
919 18th Street, N.W.
Washington, D. C. 20460

EPA PROJECT OFFICER:

Mr. Harold W. Thompson
PNERL, EPA
Corvallis, Oregon

Project Site: Patterson, California

DESCRIPTION OF PROJECT

Award Date: July 1974

Completion Date: January 1976

Project Cost: $95,500

Federal Cost: $69,500

Summary:

This study will evaluate on a proto-type scale blancher-cooler for evaluation on lima and green beans, brussel sprouts, cauliflower, and broccoli. In this system the steam condensate from the blancher (IOB) will be utilized for spray cooling of the product prior to freezing. Significant reduction in liquid effluent volume (90%), and in the organic (70%) contained therein should be demonstrated when compared to current industrial practices.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 803321

TITLE OF PROJECT: Tomato Steam Peeling and Caustic Peeling Comparison

GRANTEE OR CONTRACTOR:

Tosi Trading Company
1499 Boxshore Highway
Burlingame, California 94010

EPA PROJECT OFFICER:

Mr. James A. Santroch
PNERL, EPA
Corvallis, Oregon

Project Site: Burlingame, California

DESCRIPTION OF PROJECT

Award Date: August 1974

Completion Date: April 1975

Project Cost: $32,125

Federal Cost: $12,375

Summary:

A Vettori-Manghi pressure steam tomato peeler and a FMC Hi-TON peeler installed in parallel at Stanislaus Canners, Modesto CA will be monitored for 10 days to evaluate differences in yield, effect on tomato quality, energy requirements, the quality and quantity of wastewater and solid wastes generated and possible value of the solid wastes.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 803325

TITLE OF PROJECT: Poultry Processing Wastewater Reuse Effects on Product and Water Safety

GRANTEE OR CONTRACTOR:

Maryland State Dept. of Health
610 North Howard Street
Baltimore, Maryland 21201

EPA PROJECT OFFICER:

Mr. Jack L. Witherow
PNERL, EPA
Corvallis, Oregon

Project Site: Oakland, Maryland

DESCRIPTION OF PROJECT

Award Date: July 1974

Project Cost: $128,878

Completion Date: March 1976

Federal Cost: $79,900

Summary:

This project is to evaluate the safety for human consumption of poultry processed in a plant utilizing reclaimed wastewater in a closed loop water system. The poultry plant will recycle about 50% of their own processing wastewater. Safety will be determined by relative amounts of contaminants before and after recycling begins.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 803338

TITLE OF PROJECT: Shrimp Cannery Wastewater Treatment Demonstration Project

GRANTEE OR CONTRACTOR:

American Shrimp Canners Association
P. O. Box 50774
New Orleans, Louisiana 70150

EPA PROJECT OFFICER:

Mr. Max Cochrane
PNERL, EPA
Corvallis, Oregon

Project Site: New Orleans, Louisiana

DESCRIPTION OF PROJECT

Award Date: July 1974

Project Cost: $319,060

Completion Date: July 1977

Federal Cost: $239,295

Summary:

An in-plant water conservation and management program will be instituted along with several possible process modifications. The resulting effluent will be treated (plant scale) by screening and dissolved-air flotation with chemical addition. Screening and sludge will be processed for ultimate disposal.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

FINAL REPORTS AVAILABLE

FOOD AND KINDRED PRODUCTS

Report Number	Title/Author	Source
12060 - 03/68	Aerated Lagoon Treatment of Food Processing Wastes, Kenneth A. Dostal, Pacific Northwest Environmental Research Laboratory, EPA, Corvallis, Oregon	GPO $0.55
12060 07/69	Secondary Treatment of Potato Processing Wastes, Kenneth A. Dostal, Pacific Northwest Environmental Research Laboratory, EPA, Corvallis, Oregon	GPO $0.65
12060 10/69	Current Practice in Potato Processing Waste Treatment, University of Washington, Seattle, Washington.	GPO $1.00
12060 FAD 10/69	Aerobic Treatment of Fruit Processing Wastes, Snokist Growers, Yakima, Washington.	NTIS PB 188 506
12060 DXL 01/71	Reduction of Salt Content of Food Processing Liquid Waste Effluent, National Canners Association, Berkeley, California.	GPO $0.55
12060 04/70	Proceedings: First National Symposium on Food Processing Wastes, FWOA, USDA, National Canners Association, and Northwest Food Processors Association.	GPO $3.00
12060 ECF 04/70	Current Practice in Seafoods Processing Waste Treatment, Oregon State University Corvallis, Oregon.	NTIS PB 202 232
12060 EHT 07/70	Use of Fungi Imperfecti in Waste Control, North Star Research and Development Institute, Minneapolis, Minnesota.	GPO $1.00
12060 08/70	Waste Reduction in Food Canning Operations, National Canners Association, Berkeley, California.	GPO $1.00
12060 EZP 09/70	Cannery Waste Treatment Kehr Activated Sludge, FMO Corporation, Santa Clara, California.	GPO $0.70

Report Number	Title/Author	Source
12060 10/70	Treatment of Citrus Processing Wastes, The Coca-Cola Company - Foods Division, Orlando, Florida.	GPO $2.75
12060 EHV 12/70	Aerobic Secondary Treatment of Potato Processing Wastes, R. T. French Company, Shelly, Idaho.	GPO $1.50
12060 FQE 12/70	Dry Caustic Peeling of Tree Fruit for Liquid Waste Reduction, National Canners Association, Berkeley, California	GPO $0.60
12060 03/71	Proceedings: Second National Symposium on Food Processing Wastes, EPA, Pacific Northwest Environmental Research Laboratory and National Canners Association.	GPO $4.50
12060 EHU 03/71	Reconditioning of Food Processing Brines, National Canners Association, Berkeley, California.	GPO $0.75
12060 DSI 07/71	State-of-the-Art, Sugarbeet Processing Treatment; by Beet Sugar Development Foundation, Ft. Collins, Colorado.	GPO $1.25
12060 DXF 07/71	Membrane Processing of Cottage Cheese Whey for Pollution Abatement, Crowley's Milk Company, Binghamton, New York.	GPO $1.25
12060 EDK 08/71	Liquid Wastes from Canning and Freezing Fruits and Vegetables; by National Canners Association, Berkeley, California.	GPO $1.50
12060 EDZ 08/71	Pilot Plant Installation for Fungal Treatment of Vegetable Canning Wastes, by the Green Giant Co., Le Suer, Minnesota.	GPO $1.00
12060 EZY 08/71	Complete Mix Activated Sludge Treatment of Citrus Process Wastes, Winter Garden Citrus Products Cooperative, Winter Garden, Florida.	GPO $1.25
12060 EAE 09/71	Trickling Filter Treatment of Fruit Processing Waste Waters, National Canners Association, Berkeley, California.	GPO $0.50

Report Number	Title/Author	Source
12060 DSB 09/71	Demonstration of a Full-Scale Waste Treatment System for a Cannery, L. E. Streebin, B. W. Reid and A. C. H. Hu, School of Civil Engineering and Environmental Science, University of Oklahoma, Norman, Oklahoma.	GPO $1.50
12060 EAE 09/71	Trickling Filter Treatment of Fruit Processing Waste Waters, National Canners Association, Berkeley, California.	GPO $0.50
12060 FDS 12/70	Elimination of Water Pollution by Packinghouse Animal Paunch and Blood, Beefland International Inc., Council Bluffs, Iowa.	GPO $0.50
12120 09/69	Activated Sludge Treatment of Chrome Tannery Wastes, A. C. Lawrence Leather Company, Peabody, Massachusetts.	GPO $2.00
12120 09/70	Treatment of Sole Leather Vegetable Tannery Wastes, University of Cincinnati, Cincinnati, Ohio.	GPO $1.25
12120 DIK 12/70	Anaerobic-Aerobic Lagoon Treatment for Vegetable Tanning Wastes, University of Virginia, Charlottesville, Virginia.	GPO $1.00
EPA R2 73 209	Secondary Waste Treatment for a Small Diversified Tannery, Caldwell Lace Leather Company, Anburn, Kentucky.	GPO $1.25
EPA 660/2 73 012	Kent Cheese Company Waste Treatment Facility, Kent Cheese Company, Kent, Illinois.	GPO
EPA 660/2 74 025	Protein Production from Acid Whey Via Fermentation, Amber Laboratories, Juneau, Wisconsin.	GPO $1.25
EPA 660/2 74 031	Water and Waste Management in Poultry Processing Gold Kist Poultry, Durham, North Carolina.	GPO $2.50
EPA 660/2 74 027	Treatment of Packinghouse Wastes by Anaerobic Lagoons and Plastic Media Filters, Farmbest Inc.	GPO $1.20

Report Number	Title/Author	Source
EPA 660/2 74 046	Paunch Manure as a Feed Supplement in Channel Catfish Farming, Oklahoma State University, Stillwater, Oklahoma.	GPO $1.60
EPA R2 73 025	Anaerobic - Aerobic Ponds for Beet Sugar Waste Treatment - Beet Sugar Development Foundation, Fort Collins, Colorado.	GPO $2.10
EPA R2 73 017	Cannery Waste Treatment by Anaerobic Lagoons and Oxidation Ditch, Melbourne Water Science Institute, Victoria, Australia.	GPO $2.10
EPA R2 73 198	Low Water Volume Enzyme Deactivation of Vegetables Before Preservation, National Canners Association, Berkeley, California.	GPO $1.25
12060 EGU 03/71	Dairy Food Plant Wastes and Waste Treatment Practices, Ohio State University, Columbus, Ohio.	GPO $4.00
EPA 660/2 73 015	Recovery of Fatty Materials from Edible Oil Refinery Effluents, Swift and Company, Bradley, Illinois.	GPO $1.60
EPA 660/2 74 006	Wastewater Abatement in Canning Vegetables by IQB Blanching, University of Wisconsin, Madison, Wisconsin.	GPO $1.25
EPA 660/2 74 014	Activated Sludge - Bio-Disc Treatment of Distillery Wastewater, American Distilling Company, Pekin, Illinois.	GPO $1.40
EPA 660/2 74 074	Rum Distillery Slops Treatment by Anaerobic Contact Process, Bacardi Corporation, San Juan, Puerto Rico.	GPO
EPA 660/2 74 035	Improvement of Treatment of Food Industry Waste, RAI Research Corporation, Long Island City, New York.	GPO $1.25
EPA R2 73 024	Cannery Wastewater Treatment with Rotating Biological Contactor and Extended Aeration, Pacific Northwest Environmental Research Laboratory, EPA, Corvallis, Oregon.	GPO $0.65

Report Number	Title/Author	Source
EPA R2 73 178	National Meat Packing Waste Management Research and Development Program, EPA, R. S. Kerr Environmental Research Laboratory, Ada, Oklahoma.	GPO $0.50
EPA R2 72 018	Proceedings: Third National Symposium on Food Processing Wastes, EPA, Pacific Northwest Water Laboratory and National Canners Association.	GPO $5.25
EPA 660/2 73 031	Proceedings: Fourth National Symposium on Food Processing Wastes, EPA, Pacific Northwest Environmental Research Laboratory and National Canners Association.	GPO $4.50
EPA 660/2 74 050	Proceedings: Fifth National Symposium on Food Processing Wastes, EPA, Pacific Northwest Environmental Research Laboratory and National Canners Association.	GPO
EPA 660/2 74 060	Poultry Processing Wastewater Treatment and Reuse, Maryland State Department of Health, Oakland, Maryland.	GPO
EPA 660/2 74 059	Submerged Combustion Evaporation for Concentration of Brewery Spent Grain Liquor, Anheuser-Busch Inc., Houston, Texas	GPO
EPA 660/2 74 074	Shrimp Canning Waste Treatment Study, American Shrimp Canners Association, New Orleans, Louisiana.	GPO
EPA 660/2 74 028	Biological Treatment of Concentrated Sugar Beet Wastes, Beet Sugar Development Foundation, Fort Collins, Colorado.	GPO

JOINT INDUSTRIAL-MUNICIPAL POINT SOURCES

The "Joint" program area is defined as the TR oriented to supplying POTW's (Public Owned Treatment Works) and PTA's (Public Treatment Authorities) with the technology needed for meeting effluent standards for mixed industrial, mixed industrial and municipal, and water supply point sources of discharge. The qualifying conditions for relevancy to these point sources includes the involvement or sponsorship of a public treatment authority and the condition that the industrial portion of the wastewater be the controlling wastewater management factor.

In terms of point source standards impact, the Joint systems have direct bearing on the following standards and related technology achievement levels: (1) Toxic Standards, (2) Industrial BPT, BAT, and NSPS (New Source Performance Standards), and (3) POTW's Standards for Pretreatment, Secondary, and BPWTT.

The identification of sub-categories (program areas) is related to the characteristics of the point sources rather than the applicable sections of the numerous standards. The sub-areas are Area-Wide T&C (treatment and control), Joint Industrial-Municipal T&C, Residual and Refractory T&C, and Pretreatment.

The wastewater characteristics and related complexities of control vary as the type of industry input changes. Given the Phase I industrial guideline, the purview of this joint program area covers approximately 29 industry segments and 165 industrial technological subcategories. With Phase II guidelines providing 18 additional segments and an unknown number of subcategories.

The technology for 1977 implementation is best referenced to the 30 Phase I guidelines for industrial and municipal sources. Generally speaking, biodegradable organics and related suspended solids are controllable using biooxidation and clarification processes. The availability of viable controls for incompatible pollutants such as inorganic, toxic and residual-refractory pollutants varies from undemonstrated to inadequate effectiveness.

The prime objective of the TR program is to demonstrate adequate, practicable and economically achievable technology for the elimination of the discharge of pollutants (closed cycle) for 3 of the 4 problem areas - Area Wide, Joint, Residual and Refractory. Secondary and interim milestones also exist in the total environmental and open cycle waste management alternatives. The pretreatment segment of the program is concerned with improving the compatibility of industrial wastewaters for discharge to municipal systems.

The Area Wide T&C problem area includes those situations in which wastewaters are collected, combined, and treated for a broad geographical area. This subcategory includes: wastes from several industries combined with domestic wastes, wastes from an industrial complex, and wastes from a metro-area, or even from an entire river basin.

The Joint Industrial/Municipal problem area includes those situations where only one type of industry discharges their wastes into a municipal treatment plant. Water discharge figures for 1968 shows that of the total wastewaters discharged by manufacturing industries, 14276 bg (billion gallons), 7% or 1022 bg was discharged to public sewers. This represents about 20% of the domestic wastewater flow in 1968. Research plans call for the investigation of selected industries which have a problem with incompatible or excessive pollutants.

The residual and refractory problem area includes those industrial and municipal wastes which are in concentrated form and are either toxic or incompatible with existing biological treatment systems. Because of these factors the wastes can be most effectively managed by a common collection and treatment system which must achieve BAT or Closed Cycle effectiveness. These wastes include: liquid concentrated (paints, pigment dyes, solvents, oils, acids, alkalies), sludges (inorganic salts, organic, metallic oxides), and water treatment sludges. By providing alternate disposal techniques for these materials, they can be removed from municipal systems and land fills where they receive inadequate stabilization.

The pretreatment problem area is concerned with the treatment given an industrial wastewater prior to its discharge to a municipal sewer. Technology research will be carried out to evaluate the economic and technology impact of pretreatment guidelines at the industrial-municipal interface and to define the criteria for industrial compatibility and incompatibility relative to municipal treatment practice.

PROJECT INDEX

JOINT INDUSTRIAL/MUNICIPAL POINT SOURCES

	Grantee or Contractor	Project Status
EDX	Green Bay, Wisconsin	A
EGK	Jacksonville, Arkansas	A
EJD	Hagerstown, Maryland	B
EKK	South St. Paul, Minnesota	A
EOC	Erie, Pennsylvania	A
EZR	Dallas, Oregon	A
DBF	Harriman, Tennessee	A
DJB	Grand Forks, North Dakota	B
DLF	Tualatin, Oregon	A
DPD	Macon, Georgia	A
DRO	Delaware River Basin Commission	A
DRT	Stockton, California	A
DUJ	Walton, New York	A
FAE	Onondaga County, New York	A
FAY	Brooksville, Florida	C
FJQ	Kodiak, Alaska	A
FYF	Ohio Dept. Natural Resources	A
GER	Miami Conservancy District	B
HRA	City of Gainesville	B
801221	County of Hawaii	B
803005	Buffalo Sewer Authority	B

Project Status:

A - Completed, Final Report Available
B - Project Ongoing
C - Project Discontinued

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EDX

TITLE OF PROJECT: Joint Treatment of Municipal Sewage and Pulp Mill Effluents

GRANTEE OR CONTRACTOR:

Green Bay Metropolitan
Sewerage District
Green Bay, Wisconsin

EPA PROJECT OFFICER:

Mr. George R. Webster
Industrial Pollution Control
Division (RD-679), EPA
Washington, D. C. 20460

Project Site: Green Bay, Wisconsin

DESCRIPTION OF PROJECT

Award Date: December 1966

Project Cost: $335,000

Completion Date: September 1971

Federal Cost: $251,250

Summary:

This project determined the technical and economic feasibility of jointly treating the influent to the present treatment facilities of the Green Bay Metropolitan Sewerage District in combination with the weak effluents from the pulping sections of four local paper mills, specifically American Can Company, Charmin Paper Products Company, Fort Howard Paper Company, and Green Bay Packaging, Inc. - Four activated sludge processes (conventional, step aeration, contact stabilization, and Kraus) were studied in parallel using 1-gpm pilot plants. At the end of the 12 months, the conventional and step aeration processes were eliminated from further consideration. The contact stabilization and Kraus processes were studied for an additional four and one-half months. Contact stabilization was selected as the most promising process and units were operated for an additional five months to obtain refined design and operating parameters for a full-scale treatment plant. - Shortly after initial start-up, the pilot plants became infested with filamentous organisms identified as a bacterial species of the genus Thiothrix, a sulfur-storing organism. Of various procedures implemented, chlorination of the return activated sludge successfully controlled the growth of filamentous organisms which caused sludge bulking. It was also necessary to add nutrients to achieve the desired BOD:N:P ratios. Extensive solids-handling unit process studies were conducted at the pilot-plant site and in the cooperating manf. lab.

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EGK

TITLE OF PROJECT: Biological Treatment of Chlorophenolic Wastes

GRANTEE OR CONTRACTOR:

City of Jacksonville, Arkansas

EPA PROJECT OFFICER:

Mr. George Putnicki
Region VI, EPA
1402 Elm Street
Dallas, Texas 75202

Project Site: Jacksonville, Arkansas

DESCRIPTION OF PROJECT

Award Date: July 1968

Project Cost: $243,313

Completion Date: October 1970

Federal Cost: $153,569

Summary:

In this project, installation of a completely stirred aeration lagoon between an existing conventional sewage treatment plant and existing stabilization ponds avoided hydraulic overloading of the former and reduced BOD loading of the latter. Joint treatment of domestic sewage and an industrial waste having high BOD and chlorophenols was facilitated. This study confirmed earlier findings that the organisms present in domestic sewage readily destroy complex chlorophenols and related materials. Glycolates and acetates contributing to the high BOD of the industrial waste were also readily oxidized biologically. High sodium chloride levels in the treated mixed waste did not adversely effect biological activity. Joint treatment of the complex chlorophenolic wastes combined with normal sewage gave rise to biological data which did not differ in any significant manner from that to be expected in a similar system receiving only normal sewage. - An historical background of the problem at Jacksonville, Arkansas: design and construction information, and the chemical and biological data resulting from the system study are presented in the final report.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EJD

TITLE OF PROJECT: A Pretreatment Study on Combined Industrial-Municipal Wastewaters

GRANTEE OR CONTRACTOR:

City of Hagerstown, Maryland

EPA PROJECT OFFICER:

Mr. Harold Snyder
Environmental Protection Agency
Washington, D. C. 20460

Project Site: Hagerstown, Maryland

DESCRIPTION OF PROJECT

Award Date: March 1968

Project Cost: $427,853

Completion Date: July 1971

Federal Cost: $320,890

Summary:

This project is to evaluate pretreatment techniques for textile dyeing wastes. The dye wastes are reduced sulfur compounds with a high immediate and ultimate oxygen demand that cannot be satisfied in an activated sludge system. The pretreatment technique is to provide initial oxidation by diffused aeration, chlorination, and the separate additions of sodium nitrate and potassium permanganate. Ammoniation will also be used. The project will be for two years and include a waste source investigation, detailed baseline analyses, construction of the pretreatment facilities and full-scale paralleling of the treatment system, and evaluation of the pretreatment techniques.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the
Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EKK

TITLE OF PROJECT: Efficiency and Economy of Polymeric Sewage Clarification

GRANTEE OR CONTRACTOR:
City of South St. Paul, Minnesota

EPA PROJECT OFFICER:
Mr. Clarence C. Oster
Minnesota - Wisconsin Field
Office, EPA
7401 Lyndale Avenue South
Minneapolis, Minnesota 55423

Project Site: South St. Paul, Minnesota

DESCRIPTION OF PROJECT

Award Date: June 1967

Project Cost: $845,159

Completion Date: January 1971

Federal Cost: $450,000

Summary:

This demonstration project included: 1. Construction of new grit chambers (four units: two for industrial wastes, one for sanitary sewage, and one for either industrial or sanitary wastes), which will allow sewage to be treated individually or in combination of the two basic sewages in the treatment process following grit removal. 2. Construction of mechanical flash mix-facilities, laboratory and utility building improvements, and the necessary piping and other appurtenant construction.

The city of South St. Paul will also construct an interceptor sewer, sludge ejector, and pumping station in conjunction with the demonstration project which are not part of this demonstration grant request. The project objectives are to determine the increased purification attainable by treating industrial wastes (packing house), sanitary sewage, combined sanitary sewage, and stormwaters or combinations of such wastes with polyelectrolytes and floc "weighting agents."

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EOC

TITLE OF PROJECT: Joint Municipal and Semichemical Pulping Wastes

GRANTEE OR CONTRACTOR:

City of Erie
Erie, Pennsylvania

EPA PROJECT OFFICER:

Mr. George R. Webster
Industrial Pollution Control
Division (RD-679), EPA
Washington, D. C. 20460

Project Site: Erie, Pennsylvania

DESCRIPTION OF PROJECT

Award Date: June 1968

Completion Date: July 1969

Project Cost: $333,674

Federal Cost: $88,230

Summary:

The City of Erie, Pennsylvania and Hammermill Paper Company made a study of the joint treatment of domestic sewage and pulp and papermaking wastes. A pilot plant was constructed and operated in a series of controlled experiments. Supplemental studies were conducted in the Hammermill laboratories including the operation of a bench-scale activated sludge plant. - It was demonstrated that a joint treatment plant could effectively treat a mixture of domestic sewage and pulp and paper mill wastes from Hammermill's Erie Division. A full-scale joint treatment plant should obtain a BOD removal of approximately 90% in summer months and 80%-85% in winter months. Primary treatment should achieve a 25% reduction in BOD and a 60% reduction in suspended solids. Treatment of mixed wastes by the activated sludge process will require a long solids aeration period and a relatively low BOD to volatile solids loading to avoid high sludge volume indicies. The activated sludge process does not reduce the color of the mixed wastes and the final effluent will have about 40 mg/l of suspended solids. The chlorine demand of the final effluent averaged over 60 mg/l. A NH_3-Cl_2 mixture added at a level of 2.61 ppm NH_3 and 15-17 ppm Cl_2 showed promise as a disinfectant with coliform counts generally below 1,000/100 ml.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EZR

TITLE OF PROJECT: Combined Treatment of Domestic and Industrial Wastes by Activated Sludge

GRANTEE OR CONTRACTOR:

City of Dallas, Oregon

EPA PROJECT OFFICER:

Mr. Kenneth Dostal
Pacific Northwest Environmental Research Lab., EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Dallas, Oregon

DESCRIPTION OF PROJECT

Award Date: December 1967

Project Cost: $463,472

Completion Date: May 1971

Federal Cost: $325,104

Summary:

The operation of a completely aerobic secondary treatment facility for treatment of combined domestic and industrial wastewater from the City of Dallas, Oregon, was studied for a period of 15 months. The system was designed for an average daily flow of 2.0 mgd and a BOD load of 7000 lbs per day. The results of this study indicate the flexibility and economy of the completely aerobic system, consisting of activated sludge with aerobic digestion, for a small community with proportionately high industrial wastewater loads. The effluent BOD concentration averaged 8 mg/l and the effluent total suspended solids concentration averaged 13 mg/l for the 15-month study period. The biological solids yield averaged about 0.7 lbs of solids per lb of BOD removed and the net accumulation of biological volatile solids was about 0.42 lbs of volatile solids per lb of BOD removed. These values were obtained with a MLSS concentration range of 700 to 3000 mg/l, an average sludge age of 19 days and an organic loading range of 0.05 to 0.40 pounds of BOD per lb of MLSS per day. Total capital cost of the system was about 66% of that for a conventional activated sludge plant and operation and maintenance costs were only about 33% of those for a conventional system.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DBF

TITLE OF PROJECT: Treatment of Combined Sewage and Neutral Sulfite Semichemical (NSSC) Pulp and Paper Mill Wastes by High-Rate Biological Filtration and Extended Aeration

GRANTEE OR CONTRACTOR:

Harriman Utility Board
P. O. Box 434
Harriman, Tennessee 37748

EPA PROJECT OFFICER:

Mr. Edmond Lomasney
Region IV, EPA
1421 Peachtree Street, N.E.
Atlanta, Georgia 30309

Project Site: Harriman, Tennessee

DESCRIPTION OF PROJECT

Award Date: January 1969

Project Cost: $322,540

Completion Date: January 1972

Federal Cost: $238,905

Summary:

The Harriman Utility Board and the Mead Corporation made a study of the joint treatment of primary clarified domestic waste and neutral sulfite semichemical (NSSC) pulp and paper mill wastes. A pilot plant was constructed and operated from April, 1971 through March, 1972.

The most effective treatment scheme consisted of a biofilter (used as a roughing filter) and an extended aeration system. Color reduction was accomplished by massive lime and chlorine additions due to the color's dependency on pH. Disinfection was optimum when ammonia was mixed with the combined wastes prior to chlorination.

The biofilter's BOD removal efficiency ranged from 3 to 45%. Extended aeration's BOD removal efficiency ranged from 24% to 98%.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DJB

TITLE OF PROJECT: Controlled Treatment of Combined Potato Processing Municipal Wastes by Anerobic Fermentation, Aerobic Stabilization Process

GRANTEE OR CONTRACTOR:

City of Grand Forks, North Dakota
P. O. Box 1518
Grand Forks, North Dakota

EPA PROJECT OFFICER:

Mr. Christopher Timm
Region VIII, EPA
1860 Lincoln Street
Denver, Colorado 80203

Project Site: Grand Forks, North Dakota

DESCRIPTION OF PROJECT

Award Date: July 1968

Completion Date: August 1973

Project Cost: $796,904

Federal Cost: $389,478

Summary:

A full-scale, 4.5-mgd demonstration and evaluation of the joint treatment of municipal sewage in conjunction with potato processing wastes using several pretreatment methods prior to final treatment in existing stabilizations ponds will be undertaken in this project. The pretreatment methods include anerobic and aerated treatment (in series, anerobic treatment alone, and aeration alone) under varying seasonal waste load conditions.

In addition to determining the most efficient operation of the pretreatment methods, the effects of these methods on the conventional stabilization ponds will be extensively determined.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DLF

TITLE OF PROJECT: Tertiary Treatment of Combined Domestic/Industrial Wastes

GRANTEE OR CONTRACTOR:
City of Tualatin, Oregon

EPA PROJECT OFFICER:
Mr. Dennis Taylor
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Tualatin, Oregon

DESCRIPTION OF PROJECT

Award Date: March 1968

Project Cost: $323,600

Completion Date: August 1971

Federal Cost: $230,800

Summary:

A secondary and tertiary sewage treatment plant will be constructed for treatment of combined municipal and industrial wastes. The industrial waste is generated by the manufacture of dog food and will comprise 25% of the BOD load on the treatment plant. The plant will be operated and studied for a period of one year. The tertiary plant (consisting of flocculation, settling, and filtration) will be operated with the addition of slum for phosphate removal during the critical six months of low stream flow. During the remainder of the year, the secondary effluent will receive plain filtration to maintain a very high quality effluent. The feasibility of alternate methods of chemical sludge disposal and the economics of tertiary treatment with phosphate removal will be studied.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DPD

TITLE OF PROJECT: Combined Treatment of Municipal Kraft Linerboard and Fiberboard Manufacturing Wastes

GRANTEE OR CONTRACTOR:

The City of Macon
City Hall
Macon, Georgia 31201

EPA PROJECT OFFICER:

Mr. Edmond Lomasney
Region IV, EPA
1421 Peachtree Street, N.E.
Atlanta, Georgia 30309

Project Site: Macon, Georgia

DESCRIPTION OF PROJECT

Award Date: February 1969

Project Cost: $171,845

Completion Date: May 1971

Federal Cost: $128,883.75

Summary:

The successful treatment of domestic waste from one drainage basin of the City of Macon, Georgia, along with wastewater from an 850 ton-per-day Kraft linerboard mill and a 600 ton-per-day groundwood-cold caustic structural insulation board mill, was obtained in a 120 gallon-per-minute capacity plant. A pro-rated quantity of the total flow of each waste was treated. - The pilot plant consisted of combined and/or separate primary sedimentation units, followed by two parallel secondary treatment systems. Each secondary system received half of the plant influent. One secondary system consisted of 24-30 hours of extended aeration, while the other consisted of a high rate plastic media bio-filter followed by 12-15 hours of aeration. Both systems had secondary sedimentation and sludge return. - The secondary systems averaged approximately 92% BOD removal with an effluent concentration in the range of 50 mg/l BOD. Auxiliary studies indicated that supplemental nutrients are not required. Chlorine proved to be the best disinfecting agent, but large amounts were required. An organism in the ground wood-cold caustic operation interfered with the fecal coliform test, making disinfection studies inconclusive. Settled secondary sludge was bulky, containing one to three percent solids, and was difficult to dewater.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DRO

TITLE OF PROJECT: Deepwater - Pilot-Plant - Engineering and Interception Feasibility Study

GRANTEE OR CONTRACTOR:

Delaware River Basin Commission
25 Scotch Road - P.O. Box 360
Trenton, New Jersey 08603

EPA PROJECT OFFICER:

Mr. Gilbert Horowitz
Region III, EPA
Curtis Building
Sixth and Walnut Streets
Philadelphia, Pennsylvania 19106

Project Site: Salem County, New Jersey

DESCRIPTION OF PROJECT

Award Date: April, 1969

Project Cost: $995,650

Completion Date: April, 1972

Federal Cost: $646,700

Summary:

A pilot-plant and engineering study to develop a chemical-biological treatment process for joint industrial-municipal wastes, capable of attaining at least 88% to 93% removal of major pollutants will be completed in the project. Design, operating, and cost information is to be obtained for an 80-mgd regional treatment complex. The basic objectives of this project are:

1. Testing and evaluation of advanced waste treatment processes for final effluent polishing.
2. Development of suitable cost apportionment formulations for the treatment of various industrial wastes by a joint regional complex operated by an interstate agency.
3. Development and demonstration of the requirements for organizing, operating, and administering a regional facility by an interstate agency.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the
Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DRT

TITLE OF PROJECT: Upstream Packing House Waste Treatment Demonstration, City of Stockton

GRANTEE OR CONTRACTOR:

City Council
City of Stockton
Stockton, California

EPA PROJECT OFFICER:

Mr. Harold G. Keeler
Industrial Pollution Control
Division (RD-679), EPA
Washington, D. C. 20460

Project Site: Stockton, California

DESCRIPTION OF PROJECT

Award Date: February, 1969

Completion Date: July, 1970

Project Cost: $1,085,970

Federal Cost: $381,078

Summary:

A full-scale (2 mgd) development and demonstration of upstream treatment of packinghouse waste by use of aerobic treatment in a combination use of high rate activated sludge and in-sewer treatment will be undertaken in this project. The complex is anticipated to result in the reduction of BOD load to the municipal system of 80% and demonstration of the utility value of the conveying sewer line to further treat sewage and to reduce capitol expenditures over a typical activated sludge plant otherwise required. It is intended to consider the use of the Kehr process for partial upstream treatment during pilot studies.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DUJ

TITLE OF PROJECT: Dynamic Process Development for Biological Treatment of Whey Bearing Wastes

GRANTEE OR CONTRACTOR:

Village of Walton
Village Hall
21 North Street
Walton, New York 13856

EPA PROJECT OFFICER:

Mr. Allyn Richardson
Region I, EPA
John F. Kennedy Federal Bldg.
Boston, Massachusetts 02203

Project Site: Walton, New York
Hastings on the Hudson, New York

DESCRIPTION OF PROJECT

Award Date: February, 1969

Project Cost: $80,047

Completion Date: August, 1970

Federal Cost: $52,730

Summary:

Efforts of this one-year bench and pilot study will be concentrated in resolving problems associated with biological treatment of wastes from the manufacture of cheese and associated dairy products. Frequency response techniques will be employed in the development of activated sludge systems with stable culture separation characteristics. Odor control techniques will be evaluated in packed tower trickling filter studies. A selected process will be employed in an on-site pilot plant.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: FAE

TITLE OF PROJECT: A Demonstration of Joint Municipal-Industrial Waste Treatment in the Onondaga Lake Watershed

GRANTEE OR CONTRACTOR:

Department of Public Works
Onondaga County, New York

EPA PROJECT OFFICER:

Mr. Robert Flint
Rochester Field Office, EPA
P. O. Box 4748
Rochester, New York 14612

Project Site: Onondaga County, New York

DESCRIPTION OF PROJECT

Award Date: September 1967

Completion Date: September 1970

Project Cost: $507,700

Federal Cost: $357,150

Summary:

Onondaga Lake has been a receptor of domestic and industrial wastes to such an extent that it is now in an advanced stage of eutrophication. This project is part of a $20 million program to restore Onondaga Lake.

The objectives of this project are:

1. Demonstration of county-industry cooperative wastewater management of municipal-industrial wastes based on an entire watershed.
2. Illustration of the feasibility of treatment of mixtures of industrial and domestic wastes.
3. Demonstration of the treatment of an industrial waste stream with the waste effluent from another industry.
4. Evaluation of the effects of proposed management and treatment methods on the economics of the treatment processes and on the restoration of the lake.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: FAY

TITLE OF PROJECT: Aerobic-Anaerobic Pretreatment of Citrus Wastes

GRANTEE OR CONTRACTOR:

City Commission
City Hall
Brooksville, Florida 33512

EPA PROJECT OFFICER:

Dr. David Hill
SERL, EPA
College Station Road
Athens, Georgia 30601

Project Site: Brooksville, Florida

DESCRIPTION OF PROJECT

Award Date: June, 1970

Project Cost: $132,581

Completion Date: March, 1972

Federal Cost: $88,161

Summary:

During the grant period, the grantee will verify the design parameters for and determine the feasibility of operating an aerobic-anaerobic pretreatment system for a citrus fruit processing plant. The treatment facility will be located on city property and will be operated by the City of Brooksville. The pretreatment system consists of two aerobic basins with mechanical aerators and two anaerobic basins. These basins will be operated in sequences and combinations and under various biological conditions to determine the optimum system. The hydraulic capacity of the system is 144,000 gpd with effluent requirements of 250 mg/1 BOD, 100 mg/1 suspended solids, and pH of 6.5-8.5.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: FJQ

TITLE OF PROJECT: Pollution Abatement and By-Product Recovery in Shellfish and Fisheries Processing - Phase I

GRANTEE OR CONTRACTOR:

City of Kodiak
Box 685
Kodiak, Alaska 99615

EPA PROJECT OFFICER:

Mr. Kenneth Dostal
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Kodiak, Alaska

DESCRIPTION OF PROJECT

Award Date: April, 1970

Project Cost: $101,800

Completion Date: June, 1971

Federal Cost: $49,952

Summary:

This research and development project involves the evaluation of the various parameters involved in demonstrating the feasibility of constructing and operating a by-product recovery system for shellfish and fishery processing plants.

Objectives include:

1. Conduction of an engineering survey of industrial waste quantities.
2. Conduction of pilot-plant experiments on by-product operations.
3. Preparation of a pre-construction summary report.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: FYF

TITLE OF PROJECT: Fluidized-Bed Incineration of Selected Carbonaceous Industrial Wastes

GRANTEE OR CONTRACTOR:

Ohio Department of Natural Resources
Ohio Departments Building
Columbus, Ohio 43215

EPA PROJECT OFFICER:

Mr. Eugene Harris
NERC, EPA
Cincinnati, Ohio 45268

Project Site: Columbus, Ohio

DESCRIPTION OF PROJECT

Award Date: June, 1970

Project Cost: $140,818

Completion Date: September, 1971

Federal Cost: $98,573

Summary:

The program consisted of an initial phase in which wastes from the paint, plastics, rubber, and textile industries in Ohio were characterized. In the second phase, samples of various wastes were obtained and analyzed, and based on their characteristics, selected wastes were experimentally incinerated in a 10-inch-diameter fluidized-bed system.

Results of the program indicate that sludges from solvent recovery operations in the paint industry, sludges from primary treatment of process wastes from plastic manufacturing, flotation sludges from primary treatment of synthetic rubber manufacture, and the waste from the viscose process of the textile industry can be incinerated in a fluidized-bed system without the production of noxious or toxic exhaust gases. The program also indicates that incineration of the various wastes significantly reduces their potential impact on stream pollution. It is recommended that a demonstration plant be constructed and operated at a site close to the source of several types of industrial wastes.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the
Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: GER

TITLE OF PROJECT: Optimization of Combined Industrial-Municipal Waste Treatment Through Automation and Reuse

GRANTEE OR CONTRACTOR:

The Miami Conservancy District
38 East Monument Avenue
Dayton, Ohio 45402

EPA PROJECT OFFICER:

Mr. James Phillips
Region V, EPA
1 North Wacker Drive
Chicago, Illinois 60606

Project Site: Franklin, Ohio

DESCRIPTION OF PROJECT

Award Date: October, 1971

Project Cost: $1,240,700

Completion Date: June, 1973

Federal Cost: $606,900

Summary:

The project plan is to construct and operate a regional type waste treatment facility which will serve all industrial and municipal users within the service area. The plant will result in the abandonment of the existing City of Franklin sewage treatment plant and four industrial treatment facilities, all of which are grossly inadequate. The project will stress high reliability and performance, flexibility, economy, recovery, and recycle of pollutants and treated wastewater, and automation of waste treatment systems.

The project plant includes the evaluation and economic analysis of: 1. Separate industrial collection, primary treatment, and solids disposal facilities. 2. Recovery and reuse of industrial by-products. 3. Reuse of treated wastewater for industrial process. 4. Waste solids disposal by soil stabilization. 5. Secondary treatment of combined industrial waste by: (a) plug flow, hybrid flow, and completely mixed aerated stabilization, (b) activated sludge, and (c) contact stabilization. 6. Process control computer.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: HRA

TITLE OF PROJECT: Tertiary Treatment of Municipal and Industrial Waste Waters with Recycled $MgCO_3$ and Lime

GRANTEE OR CONTRACTOR:

Department of Public Utilities
City of Gainesville
Gainesville, Florida 32601

EPA PROJECT OFFICER:

Mr. Edmond Lomasney
Region IV, EPA
1421 Peachtree Street, N.E.
Atlanta, Georgia 30309

Project Site: Gainesville, Florida

DESCRIPTION OF PROJECT

Award Date: July, 1971

Project Cost: $141,280

Completion Date: June, 1973

Federal Cost: $64,280

Summary:

During this 24-month project laboratory investigations will be initiated to develop the technology for using $MgCO_3$ and lime in a tertiary clarification process for the treatment of selected industrial and municipal waste waters. The techniques for the recovery and reuse of $MgCO_3$ and lime will be optimized for the waste waters under evaluation. Data obtained from the development activities will be utilized to design and operate a pilot scale system for the evaluation of the clarification process on municipal wastes.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 801221

TITLE OF PROJECT: Ecostatic Cane Processing System - Pilot Phase

GRANTEE OR CONTRACTOR:

County of Hawaii
25 Aupuni Street
Hilo, Hawaii 96783

EPA PROJECT OFFICER:

Mr. Kenneth Dostal
NERC, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Pepeekeo, Hawaii

DESCRIPTION OF PROJECT

Award Date: April, 1972

Project Cost: $979,390

Completion Date: March, 1973

Federal Cost: $109,000

Summary:

The applicant proposes to pilot plant several systems on a large scale which, if successful, would result in the processing of raw cane sugar with no discharge of liquid wastes to the environment and provide proper handling techniques for the various forms of solid waste. Systems to be evaluated include: a field harvester-cleaner, a dry cane cleaner, a juice wet cane cleaner (with juice added back to the process stream), a trash dry cleaner, a trash wet cleaner with silt removal and complete recycle of water on a stabilized slope disposal system for thickened muds.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 803005

TITLE OF PROJECT: Buffalo Sewer Authority Pretreatment Project

GRANTEE OR CONTRACTOR:

Buffalo Sewer Authority
1038 City Hall
Buffalo, New York 14202

EPA PROJECT OFFICER:

Dr. Thomas Short
RSKERL, EPA
P. O. Box 1198
Ada, Oklahoma 74820

Project Site: Buffalo, New York

DESCRIPTION OF PROJECT

Award Date: April, 1974

Project Cost: $176,500

Completion Date: September, 1975

Federal Cost: $96,500

Summary:

To establish a method of controlling industrial wastewater entering the Buffalo Sewer Authority (BSA) Sewerage System and to formulate a method for assessing charges. Guidelines for pretreatment of industrial wastes and the operation of a wastewater control section within the BSA will be outlined. Specifically included are the following: 1) Conduct a survey of industrial and large commercial establishments. 2) Monitor the existing BSA primary plant to evaluate loadings, toxic materials and inhibiting pollutants. 3) Determine to what extent significant industrial discharges affect the system, and identify gaps in industrial pretreatment technology. 4) Compare existing treatment and control requirements with new regulations. 5) Identify changes required in municipal and/or industrial sector to meet new regulations. 6) Assess best alternative to effect changes required to meet new standards including technical and economic considerations. 7) Formulate a method of assessing industry in connection with Title II of the Federal Water Pollution Control Act.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

FINAL REPORTS AVAILABLE

JOINT INDUSTRIAL/MUNICIPAL POINT SOURCES

REPORT NUMBER	TITLE/AUTHOR	SOURCE
11060 EOC 07/69	Joint Municipal and Semichemical Pulping Wastes, City of Erie, Pennsylvania and Hammermill Paper Company.	GPO - $1.50
11060 FAE 11/69	Feasibility of Joint Treatment in a Lake Watershed, Onondaga County, New York.	NTIS PB 201 698
11060 FAE 04/71	Onondaga Lake Study, Onondaga County, Syracuse, New York.	GPO - $4.50
11060 DPD 02/71	Combined Treatment of Municipal Kraft Linerboard and Fiberboard Manufacturing Wastes; by Board of Water Commissioners, City of Macon, Georgia, Georgia Kraft Co., and Armstrong Cork Co.	GPO - $1.25
12130 EDX 07/70	Joint Treatment of Municipal Sewage and Pulp Mill Effluents, the Green Bay Metro Sewage District, Green Bay, Wisconsin	GPO - $6.00
12130 EZR 05/71	Combined Treatment of Domestic and Industrial Wastes by Activated Sludge, City of Dallas, Oregon.	GPO - $1.25
12130 EGK 06/71	Biological Treatment of Chlorophenolic Wastes, City of Jacksonville, Arkansas.	GPO - $1.50
12130 FJQ 06/71	Pollution Abatement and By-Product Recovery in Shellfish and Fisheries Processing, Food Chemical and Research Labs., Inc., Seattle, Washington, and Engineering Science of Alaska, Anchorage, Alaska.	GPO - $1.00
12130 DUJ 09/71	Whey Effluent Packed Tower Trickling Filtration, by Quirk, Lawler & Matusky Engineers, Tappan, New York.	GPO - $1.50
EPA 660/2-73-038 3/74	Deepwater Pilot Plant Feasibility Study, Delaware River Basin Commission, Trenton, New Jersey, 08603.	GPO - $4.10
12120 FYF 03/72	Fluidized-Bed Incineration of Selected Carbonaceous Industrial Wastes, State of Ohio, Dept. of Natural Resources, Columbus, Ohio.	GPO - $1.00

REPORT NUMBER	TITLE/AUTHOR	SOURCE
12010 DTQ 02/72	Combined Steel Mill and Municipal Wastewater Treatment, Weirton Steel Division, National Steel Corp., Weirton, West Virginia, 26062	GPO - $1.50
EPA 660/2-73-010 12/73	Treatment of Domestic Wastewater and NSSC Pulp and Paper Mill Wastes, Harriman Utility Board, Harriman, New York.	GPO - $1.40
EPA R2-73-236 11060 DLF	Tertiary Treatment of Combined Domestic and Industrial Wastes, by J. W. Lee, CH2M/HILL, Corvallis, Oregon.	GPO - $2.60
EPA 660/2 74020	Evaluation of Polymeric Clarification of Meat-Packing and Domestic Wastewater, by K. D. Larsen and D. A. Maulwauf, Metropolitan Sewer Board, South St. Paul, Minnesota.	GPO -

METAL AND METAL PRODUCTS

This program is classified into four broad categories. They are the ferrous metals industries, the non-ferrous metals industries, the metal fabrication and finishing operations, and the machinery and transportation equipment manufacturing industries.

The basic objective of the industrial wastewater management treatment research program is to achieve closed-loop type of control due to the passage of the Federal Water Pollution Control Act Amendments of 1972, designated as PL 92-500.

In general, the following programmed steps are necessary to accomplish the most economical pollution abatement of these significant industrial sectors both from the short and long range standards.

1. Define the problem by identifying all waste sources including the characteristics, volumes, and pollutant loads.
2. Implement process changes and in-plant control techniques for eliminating unnecessary wastes and conserving water.
3. Evaluate closed-loop technology and apply such systems to achieve maximum recovery of chemicals and reuse of water.
4. Carefully assess the alternative technology for treating the remaining waste discharges to meet the Federal effluent requirements with a minimum of capital, energy, operating, and solid disposal costs.

The steel, machinery, transportation equipment, and metal finishing (excluding electroplating) industries are defined by the following Standard Industrial Classification (SIC) Numbers: 331, 332, 34 (except 3471), 35, and 37. The non-ferrous metals and electroplating industries are defined by the following SIC Numbers: 333, 334, 335, 336, and 3471.

IRON AND STEEL MANUFACTURING: COKING, IRON MAKING, STEEL MAKING SEGMENT

The steel industry uses about 18 billion gallons of water per day or 10 percent of the total industry usage. This industry is a 20 billion dollar a year business which ranks third behind the automotive and petroleum industries in the value of its shipments. Approximately 92 percent of the total U.S. steel production is produced by 15 major steel corporations with approximately 70 percent being produced by seven of the major corporations in 47 plants. These seven corporations are: U. S. Steel Corporation in Pittsburgh, PA; Bethlehem Steel Corporation in Bethlehem, PA; Republic Steel Corporation in Cleveland, Ohio; National Steel Corporation in Pittsburgh, PA; Armco Steel Corporation in Middletown, Ohio; Jones and Laughlin Steel Corporation in Pittsburgh, PA; and Inland Steel Company in Chicago, Illinois.

The steel industry is composed of some 102 companies operating 420 plants. Of these, 63 are integrated plants, 96 are non-integrated and 260 are hot and cold working plants. These plants are located in almost every state, but the principal concentration is in the northwest quadrant of the country in the States of New York, Pennsylvania, Ohio, Indiana, and Illinois.

Generalizations about steelmaking operations are difficult because exceptions can be found in every mill. Steel mills in operation today range from older marginal mills built early in this century to new modern facilities built in the last several years.

Significant waterborn wastewaters result from all steel mill manufacturing operations. These wastes are principally suspended solids, oils, waste acids, ammonia, cyanides, phenols, chlorides, fluorides, sulfides, heavy metals, and heated discharges.

Basic processing operations include: by-product coke manufacturing: blast furnaces; steel making (electric furnaces, basic oxygen furnaces, and open hearth furnaces); vacuum degassing operations; continuous casting; sintering operations; rolling mill operations: and finishing operations.

Each of these basic operations contains a large complexity of pollutant discharges into the environment. For the coking operation, wastes are emitted from the waste ammonia liquor, still wastes, final cooler wastes, and light oil recovery wastes. The blast furnace, with similar pollutants to the coking operation, has its main aqueous waste resulting from gas cleaning with wet washers. The actual steel making operation generates liquid wastes from the air pollution control equipment, such as: sparking boxes, spray chambers, and venturi scrubbers. The degassing operation has liquid wastes from the barometric condenser cooling water. Cooling water discharge results from the casting operations, whereas dust control equipment creates the sintering operations wastewater. The rolling mill operation has wastewater from the scale, lubricating oils, spent pickling operations, and pickling rinse waters.

Treatment technology differs for each of the respective unit operations. The coking operation employs, for the waste ammonia liquor, anhydrous recovery, bio-oxidation of cyanides and phenols, ammonia denitrification, and possibly total incineration. Closed loop is achievable for the final cooler water and a minimum blowdown with tight recycle is available for the light oil recovery wastes. The blast furnace available treatment includes suspended solids removal by sedimentation and a tight recycle system similar to the coking operation. Besides sedimentation and tight recycle, the actual steelmaking operation employs, for new sources, several dry collection methods including electrostatic precipitators or bag houses. The vacuum degassing operation treats its cooling water wastes by sedimentation, filtration, cooling, and recycle. The continuous casting mode recycles spray cooling waters with scale pit sedimentation followed by filtration or cooling. The sintering phase employs dry dust collection and gas cleaning equipment for new plants whereas the wet systems incorporate a complete recycle consisting of a thickener (polyelectrolyte addition), vacuum filter and clarifier. The recycle blowdown consists of, aeration for oil removal, lime precipitation, fluoride neutralization, and addition of final thickeners.

The rolling mill operation employs crude settling chambers for scale and oil recovery, lime neutralization and deep well disposal for strong pickling operations, recovery of oily wastewaters by primary belt skimming, chemical coagulation, magnetic agglomeration, and deep filtration. The main treatment operations employed in the finishing operations include chrome reduction, cyanide oxidation, sedimentation, and metal sludge filtration.

Technological gaps exist in the iron and steel treatment technology. These areas will be covered essentially by wastewater constituents and their removal.

Cyanides have been proven to be quite troublesome and toxic. The oxidation to cyanates (CNO^-) or carbon dioxides (CO_2) by various oxidizers (alkaline chlorination or hypochlorite) has been accomplished for the electroplating wastes but has not been proven effective in polishing operations for activated sludge reaction effluents. Bioxidation is effective but generally susceptible to shock loads and requires a long residence time. Cyanide removal by ion exchange columns is effective but expensive.

The phenolic wastes can be removed by either liquid extraction or vapor recirculation but these methods are not economical. The same applies to bio-oxidation of phenols.

Effective methods of ammonia recovery and removal require the use of an ammonia still and gas liquid adsorption. These processes are not popular with the industry and include indirect and semi-direct recovery as well as the keystone process. Biological nitrification-denitrification of ammonia is not feasible currently because of inherent system instabilities. The ion exchange removal approach looks promising but little has been done.

Another problem area is the treatment or disposal of spent pickling solutions. The simplest method is, of course, neutralization but unfortunately leaves a great deal of dissolved solids. Ion exchange removal has been demonstrated for sulfuric and hydrochloric acid. Direct crystallization of $FeSO_4$ from either sulfuric or hydrochloric liquors. The acid is regenerated in the process and the entire procedure looks promising. Finally spent pickling solution separation by reverse osmosis is now only a matter of speculation.

In general, the future development and demonstration projects in this industry will focus upon meeting the mandates of PL 92-500 and minimizing energy usage, fuel consumption, and pollutant output.

Some technologies to be implemented in the near future include: open cycle on slag and sludge dewatering and disposal; (best available treatment) technology development for a closed loop in an integrated steel mill (closed cycle); open cycle for reducing phosphates and heavy metals by the employment of iron pellets without any additional chemical addition to sludges; employment of electromembranes in the H_2SO_4 pickling operation to achieve a step towards closed cycle; and finally a new technology is emerging using direct reduction of low grade taconite ore effectively eliminating the blast furnace and coking operation to achieve total environmental control.

All of these aforementioned technologies will be attempted in the near future to improve the steelmaking industries' technology and to "preserve the integrity of our nation's waterways."

NON-FERROUS METALS

The non-ferrous metals industry in the United States is large and diversified. The major non-ferrous metals from the standpoint of tonnages produced are aluminum, copper, zinc, and lead. These metals constitute over 70 percent of the total production of non-ferrous metals. Some of the other important non-ferrous metals are manganese, chromium, nickel, sodium, tin, magnesium, molybdenum, uranium, antimony, titanium, tungsten, silver, cadmium, cobalt, vanadium, mercury, tantalum, gold, and the rare earths.

The major processing operations that are carried out in the non-ferrous metals industry are: mining and milling: leaching of metal compounds; smelting; refining; and the fabrication of the metals into sheets, wire, tubing, and other shapes. Smelters and refiners are categorized as primary or secondary, depending upon whether ore or scrap are used as the principle source of the metal.

There are approximately 100 primary non-ferrous metal plants and at least several hundred secondary plants in the United States. The average employment for primary and secondary plants is about 500 and 100 people, respectively. The four major non-ferrous metals were produced in the following quantities in 1971.

TYPE OF OPERATION	METAL PRODUCTION (SHORT TONS)
Primary Aluminum	3,925,223
Secondary Aluminum	813,741
Primary Copper	1,470,850
Secondary Copper	445,157
Primary Lead	650,000
Secondary Lead	596,797
Primary Zinc	347,356
Secondary Zinc	359,200

Besides these primary and secondary facilities, there are over 2,000 fabricating plants that make tubes, wires, sheets, plates, castings, etc., from non-ferrous metals.

The non-ferrous metals industry uses large quantities of water for cooling and processing purposes. It is estimated that the total industry uses approximately 1.5 billion gallons of water per day.

The major wastewaters arising in the industry are mud slurries, flotation plant tailings, gas scrubber waters from smelting and refining, discarded leach liquors, spent electrolyte solutions, clean-up water, slag and ore storage runoff, direct contact cooling water, and oil-bearing lubricating wastes, process bath dumps, leaks and spills, and rinsewaters from fabricating facilities.

The most significant pollutants discharged by the industry are inorganic solid particles, a wide variety of toxic heavy metals, acids and alkalies, fluoride, cyanide, lubricating oils, and sludges. Among the minor contaminants are dissolved salts, BOD, and COD.

The present waste treatment practices used in the milling, concentrating, smelting, and refining segments of the non-ferrous metals industry consist primarily of neutralization and settling. Relatively little attention has been given to the removal of heavy metals and other toxic contaminants which are usually diluted in the overall plant waste discharge. However, substantial progress has been made in water recycling and reuse.

Primary aluminum plants have proceeded much further than other segments of the industry in attacking the pollution problem at the source. There is a continuing trend in these plants toward implementing dry fume scrubbers and the recycle of water to the wet scrubbers after precipitation of the fluorides.

The fabricating segment is more advanced than the remainder of the non-ferrous metal industry in the implementation of wastewater abatement technology. The major water pollution problems occur in copper and brass mills where sulfuric acid and chromic acid are used for pickling and bright dipping, respectively. In addition to chemical treatment, waste abatement techniques include process changes (replacement of chromic acid with hydrogen peroxide for bright dipping), electrolytic recovery and purification of process baths, cementation for the removal of copper and reduction of chromium in rinsewaters, and integrated chemical treatment of rinsewaters. A new approach is the use of reverse osmosis/evaporation for treating the overall wastes from the plant. The only other significant waste problems occur in the aluminum fabricating plants where the metal finishing operations are performed in the mill. Treatment methods include neutralization and precipitation, ion exchange, and evaporation.

The projected long term direction of development is toward recycling, recovery, and closed loop type of waste treatment technology. In milling, smelting, and refining operations, the approach will be to abate the problems at the source where feasible by process changes, dry treatment systems and advanced waste treatment/recovery technology. Among the treatment methods with potential are: ion exchange, ion flotation, electrolytic techniques, cementation, membrane systems, evaporation, freezing, extraction, high temperature-pressure crystallization, and the recovery of metals from sludges. Some of the more potentially attractive methods for treating wastes produced at fabricating plants are reverse osmosis for concentrating oil or chemicals, ion exchange, electrolytic techniques, electrodialysis, evaporation, and cementation.

METAL FINISHING

There are about 20,000 metal finishing facilities in the United States. The metal finishing industry consists of several thousand job shops, some larger independent shops, and the remainder are capitive facilities associated with the automotive, aircraft, electronics, appliance, jewelry, and other industries. The largest volume of metals used in plating operations are nickel, copper, chromium, and zinc. Other important, but lesser used, plating metals are cadmium, brass, silver, gold, and lead. Tin is the highest volume metal employed in plating, but the process is used in steel mills and the effluents produced are associated with steel manufacturing wastes.

The processes used in the industry are: (1) Cleaning for the removal of surface oils, grease, dirt, buffing compounds, etc.: (2) Removing undesirable surfaces such as rust and scale by pickling, defective metal surfaces by stripping, and portions of metal surfaces by etching, and (3) Electrochemical and chemical processing for surface coating a basis metal.

Metal surface preparation and cleaning are accomplished by mechanical finishing activities, organic solvents and alkaline cleaners, and pickling solutions. Most pickling operations simply involve solubilizing the oxide scale in acids such as sulfuric, hydrochloric, phosphoric, nitric, and hydrofluoric, but some pickling is also carried out with alkaline solutions.

Electroplating solutions are basically either acid or alkaline baths. Acid plating solutions contain free acid and heavy metals (usually chromium, nickel, copper, and zinc). Alkaline plating baths are mainly in the form of complex cyanide solutions of metals such as copper, zinc, and cadmium.

Other finishing operations include chromate conversion coating, anodizing, phosphate coating, stripping, etching, bright dipping, electro and chemical polishing, plating on plastics, and the application of organic coatings on metals.

The wastes produced in metal finishing facilities are from spent baths, rinsewaters, accidental discharges, plant and equipment cleanup, and regenerants from ion exchange systems.

The primary environmental concern of the industry is water pollution. Waterborne wastes contain toxic pollutants such as cyanide and heavy metals, corrosive substances, oil and grease, surface active agents, organic solvents, nutrients and settleable solids.

The methods used for the abatement of pollution involve inplant control techniques and the installation of treatment or recovery processes to destroy or remove objectionable substances in the wastewater.

Inplant abatement practices involves techniques for reducing dragout from process tanks into the rinsewater, effective rinsing, water reuse, and preventing spills, leaks, and other accidental losses.

The method generally used to treat metal finishing wastes involves reduction of chromates, neutralization, separation of precipitated metal hydroxides, and disposal of the sludge.

Other techniques that have achieved significant application for treating metal finishing wastewaters are ion exchange, evaporation, and the integrated or chemical rinse system for treating dragout prior to water rinsing.

In addition, there are a number of metal finishing waste treatment methods that have had limited application or are stages of development or demonstration such as electrolytic destruction of cyanide in strong baths, the Kastone process (hydrogen peroxide destruction of cyanide), reverse osmosis, electrodialysis, ozone destruction of cyanide, carbon bed catalytic rinsewaters, and sulfide precipitation of heavy metals. A number of methods are in the early development stage. These include ion flotation, freezing, a waste-plus-waste process, activated carbon removal of chromates from rinsewaters, and fluidized bed electrolytic processes using conductive and nonconductive particles for treating dilute wastes.

The projected long term research planned for abating pollution in the metal finishing industry is outlined as follows:

a. Open Cycle Technology - Develop and demonstrate best available treatment economically achievable. Examples of specific studies planned are sulfide precipitation, and a three bed ion exchange system for treating cyanide bearing rinsewaters.

b. Closed Cycle Technology - Develop and demonstrate technology with high chemical recovery and water reuse potential such as reverse osmosis, electrodialysis, freezing, electrolytic processes for use on the various wastes generated in the metal finishing industry, and a new rising film evaporator for treating rinsewaters.

c. Develop and demonstrate techniques and procedures for recovering the metal values from individual and mixed sludges produced by the various chemical treatment techniques. Bench scale investigations have already been completed on techniques for recovering metals from the widely produced mixed metal hydroxide precipitates. Investigations in full-scale systems have also been conducted on recovering certain metals from sludges produced in the integrated system and Kastone process. The stabilization of unrecoverable residues for disposal to landfills, etc., are necessary.

d. Further research will be conducted to integrate the aforementioned technologies with the lowest energy intensive modes possible.

MACHINERY AND TRANSPORTATION EQUIPMENT MANUFACTURING

Industrial activities in the Standard Industrial Classification (SIC) Groups 35 (Machinery), 36 (Electrical Machinery), and 37 (Transportation Equipment) are included in this subprogram element. Combined water usage is approximately 4.4 billion gallons per day or 4.5 per cent of industrial water use. Approximately 0.38 billion gallons per day is used in processing operations. Oil, particulate matter, and cleaners constitute the principal contaminants in wastewaters that arise in processes other than finishing operations. The physical process of sedimentation, flotation, and chemical neutralization are the most frequently employed treatment methods. Metal finishing operations, waste characteristics, and treatment methods and objectives are similar to those described in the previous section.

The program objectives are met through a research and development planning function located at EPA Headquarters, Washington, D. C., and an implementation program located for metal finishing and the non-ferrous industries, at the Industrial Waste Treatment Research Laboratory in Edison, New Jersey, and for iron and steel, transportation, and machinery at the EPA installation at Grosse Ile, Michigan.

PROJECT INDEX

METAL AND METAL PRODUCTS

	Grantee or Contractor	Project Status
DFS	RAI Research Corporation	A
DHP	Clarkson College of Technology	C
DIM	University of Utah	A
DMF	The Beaton and Corbin Manufacturing Company	A
DNF	CF&I Steel Corporation	C
DOT	University of Waterloo	B
DPF	Volco Brass and Copper Company	A
DRE	Interlake Steel Corporation	C
DRH	Minnesota Pollution Control Agency	A
DSA	S. K. Williams Company	A
DTQ	Weirton Steel Corporation	A
DUL	Armco Steel Corporation	A
EDY	American Iron and Steel Institute	C
EIE	Metal Finishers' Foundation	A
EQF	Alabama Water Improvement Commission	A
EZV	Armco Steel Corporation	A
FNM	The Fitzsimons Steel Company, Inc.	B
FPK	Battelle Memorial Institute	A
FXD	Metal Finishers' Foundation	B
GCS	Aerodex, Inc.	B
GUG	New England Plating Company, Inc.	B
GVV	Michigan Plating and Stamping Company	C
HGH	Grumman Aerospace Corp.	A

	Grantee or Contractor	Project Status
HOW	Alan Wood Steel Company	B
HQJ	American Electroplaters' Society, Inc.	B
PPB	The John Hopkins University	A
WPRD 41	Chemical Separations Corporation	C
800625	Attorney General of Illinois	B
800680	Grumman Aerospace Corporation	A
800772	Alan Wood Steel Company	B
801989	National Steel Corporation	B
802113	Metal Finishers' Foundation	B
802142	Toledo Pickling and Steel Service	B
802254	Anaconda American Brass Company	A
802335	Sealectro Corporation	B
802390	University of Arizona	B
802637-01	Douglas & Lomason Corporation	B
802637-02	Douglas & Lomason Corporation	B
802924	Metal Finishers' Foundation	B
803064	The Boeing Company	B
803073	The Boeing Company	B
803177	The Singer Company	B
803226	Anaconda American Brass Company	B
803261	Aluminum Company of America	B
803264	American Electroplaters' Society Inc.	B
803265	Metal Plating Corporation	B
803304	Keystone Lamp Manufacturing Corporation	B

	Grantee or Contractor	Project Status
803332	Texas Southern University	B
803342	Metal Finishers' Foundation	B
803467	Dr. George E. F. Brewer	B

Project Status:
A - Completed, Final Report Available
B - Project Ongoing
C - Project Discontinued

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DFS

TITLE OF PROJECT: Treatment of Cyanide Rinse Waters by Electrodialysis

GRANTEE OR CONTRACTOR:

RAI Research Corp.
36-40 37th Street
Long Island City, New York 11101

EPA PROJECT OFFICER:

Lloyd Kahn
Edison Water Research Division
Edison, New Jersey 08817

Project Site: Long Island City, New York

DESCRIPTION OF PROJECT

Award Date: November 1968

Project Cost: $83,835

Completion Date: December 1969

Federal Cost: $58,685

Summary:

In a typical metal plating operation, electroplated work is removed from the plating bath and rinsed. The rinsewater discharged from the operation contains components of the plating bath. When cyanide baths are used the waste is highly deleterious and toxic. - A system is developed in this study whereby the discharge of rinsewater is eliminated. The work, according to this method, is rinsed in a sequence of two rinses; the final rinse contains a concentration of cyanide of 1/10,000 of that of the plating bath. - These concentrations are maintained by the use of electrodialysis to transport cyanides from the second rinse solution to the first rinse solution and also from the first rinse to the plating bath. In this way, all cyanide is recovered and returned to the bath. Design parameters are determined from the experiments of this study and costs are estimated. - The experimental system used in this study was a prototype of a commercial-size electrodialysis unit operated continuously under conditions which simulated those of the projected two-stage commercial system using a cyanide copper plating bath.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DHP

TITLE OF PROJECT: Metal Removal/Recovery from Polluted Water by Complexation with Linear Polyelectrolytes

GRANTEE OR CONTRACTOR:

Department of Chemistry
Clarkson College of Technology
Potsdam, New York 13676

EPA PROJECT OFFICER:

Mr. Clifford Risley
Region V, EPA
1 North Wacker Drive
Chicago, Illinois 60606

Project Site: Potsdam, New York

DESCRIPTION OF PROJECT

Award Date: March, 1970

Project Cost: $30,780 (2nd yr)

Completion Date: March, 1971

Federal Cost: $27,086 (2nd yr)

Summary:

Polygalacturonic acid as received from the manufacturer and in purified form has been investigated in detail as a complexing agent for heavy metal ions (in particular, Cu^{++}, Cd^{++}, Zn^{++} and Ni^{++}), especially for rinse waters of the electroplating and mining industries. This natural acid was found to be an efficient complexing agent for metal cations; the latter can be recovered from the complexes by leaching with 1.5 N HCl. The remaining polymer can be recycled with very little loss (ca. 3%) for further complexation. The decisive discovery was made that the complex-precipitates have very small volumes if polygalacturonic acid is added in powder form. The consequence is that only small volumes of 1.5 N HCl are needed for leaching and that the ratios of the concentrations of recovered metal ions in the final solutions to those in the original solutions range from several hundred to several thousand. The concentrations of ions left in the original solutions are near the limits for potable water except in the case of nickel. - From an economical point of view it may be advantageous to work with pectin, the raw material of polygalacturonic acid, in spite of the fact that about 20-30 percent more of pectin than polygalacturonic acid is needed to achieve the same amount of complexation.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DIM

TITLE OF PROJECT: Pyrite Depression by Reduction of Solution Oxidation Potential

GRANTEE OR CONTRACTOR:

Dept. of Mineral Engineering
University of Utah
Salt Lake City, Utah

Project Site: Salt Lake City, Utah

EPA PROJECT OFFICER:

Mr. James V. Rouse
Division of Field Investigations
Denver Center, EPA
Denver Federal Center, Bldg. 22
Denver, Colorado 80225

DESCRIPTION OF PROJECT

Award Date: January, 1969

Completion Date: July, 1970

Project Cost: $13,559

Federal Cost: $12,663

Summary:

In this study of pyrite depression by reducing agents with potassium ethylxanthate as collector, it has been shown that pyrite may be depressed effectively in the flotation of both lead and copper sulfide ores without the use of poisonous cyanide salts. More specifically, the use of sodium sulfite as the depressant may result in metallurgical, economical, environmental, and safety advantages over the use of cyanide, a poison. For example, in the case of the copper ore, the best results with cyanide as the depressant were a rougher concentrate recovery of 90.2% and a grade of 4.3% Cu. However, when sulfite was used as the depressant for the same recovery a grade of 7.3% Cu was obtained. - Experimental results support the theory that dixanthogen is the collector species responsible for pyrite flotation. The study shows that pyrite depression is possible by maintaining a reduced solution oxidation potential thus preventing dixanthogen formation. Depression was effected with the following reducing agents: sulfite, sulfide, thiosulfate, hypophosphite, and oxalate. In all cases the results were similar. The proposed mechanism of depression involves the adsorption of the reductant on surface active sites, thus preventing the adsorption and dissociation of molecular oxygen to nascent oxygen.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DMF

TITLE OF PROJECT: Chemical Treatment of Plating Waste for Elimination of Chromium, Nickel and Metal Ions

GRANTEE OR CONTRACTOR:

The Beaton and Corbin Mfg. Co.
Southington, Connecticut

EPA PROJECT OFFICER:

Mr. John Ciancia
Industrial Waste Treatment
Research Lab, EPA
Edison, New Jersey 08817

Project Site: Southington, Connecticut

DESCRIPTION OF PROJECT

Award Date: June, 1968

Project Cost: $58,220

Completion Date: April, 1971

Federal Cost: $37,250

Summary:

Chemical rinses for electroplating dragout contamination and batch chemical treatment for spent processing solution are demonstrated as a practical method of removal of chromium, nickel, zinc, and copper ions to a level where substantial quantities of water may be reused.

The toxic metal ions are precipitated by chemical means in an easily settled sludge and subsequently further compacted in simple outdoor earthen sludge beds for ultimate disposal as landfill.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DNF

TITLE OF PROJECT: Research Study of Coal Preparation Plant and By-Product Coke Plant Effluents

GRANTEE OR CONTRACTOR:

CF&I Steel Corporation
P. O. Box 1920
Denver, Colorado 80201

EPA PROJECT OFFICER:

Mr. Fred Pfeffer
R. S. Kerr Environmental
Research Lab, EPA
P. O. Box 1198
Ada, Oklahoma 74820

Project Site: Pueblo, Colorado

DESCRIPTION OF PROJECT

Award Date: March, 1969

Completion Date: August, 1970

Project Cost: $205,000

Federal Cost: $86,500

Summary:

This project will provide for: (a) a study of waste sources, volumes, and characteristics; (b) laboratory and bench-scale studies of alternate treatment processes; and (c) a study of additions to planned coal washery filtration facilities to develop reuse possibilities of non-coking solids and solids waste disposal. Development of methods for wastewater treatment to produce effluents suitable for reuse or discharge in accordance with state stream standards will be a major objective.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DOT

TITLE OF PROJECT: Detoxication of Cyanide Wastes by Electroxidation

GRANTEE OR CONTRACTOR:

Department of Chemical Engineering
University of Waterloo
Waterloo, Ontario, Canada

EPA PROJECT OFFICER:

Mr. Clifford Risley
Region V, EPA
1 North Wacker Drive
Chicago, Illinois 60606

Project Site: Waterloo, Ontario, Canada

DESCRIPTION OF PROJECT

Award Date: May, 1970

Completion Date: October, 1971

Project Cost: $10,600 (2nd yr)

Federal Cost: $10,065 (2nd yr)

Summary:

An experimental study was carried out to determine the feasibility of detoxicating dilute cyanide plating wastes by electrooxidation. Because of the high toxicity of cyanide in the free or complexed form to aquatic and animal life and its detrimental effect on the operation of sewage treatment plants, in-plant purifcation of dilute cyanide wastes is essential. Although successful processes have been developed for destroying cyanide in concentrated plating wastes, the economic feasibility of electrolytic technique for treating dilute wastes has not been established. - An electrochemical demonstration unit has been developed for the treatment of dilute cyanide plating wastes. The cyanide and plating metal concentrations can be reduced to less than 1 ppm. Energy requirements vary according to the duty and mode of operation ranging from 40 KWhr to 140 KWhr/lb CN.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DPF

TITLE OF PROJECT: Treatment Recovery, and Reuse of Copper Wire Mill Pickling Wastes

GRANTEE OR CONTRACTOR:

Volco Brass and Copper Co.
Kenilworth, New Jersey 07033

EPA PROJECT OFFICER:

Mr. John Ciancia
Industrial Waste Treatment
Research Lab, EPA
Edison, New Jersey 08817

Project Site: Kenilworth, New Jersey

DESCRIPTION OF PROJECT

Award Date: June, 1968

Project Cost: $177,159

Completion Date: December, 1970

Federal Cost: $124,000

Summary:

The final report to the project describes process changes and waste treatment, recovery, and reuse facilities installed by Volco Brass and Copper Company, located in Kenilworth, New Jersey. The plant produces 75 tons of wire per day.

An electrolytic system was installed to recover copper from the spent primary pickle solution and to regenerate the sulfuric acid for reuse. A hydrogen peroxide bright pickle replaced the chromate and fluoride bright pickles previously used. Copper from the bright pickle is also recovered in the electrolytic system. The electrolytic copper is reused on location in casting. An integrated copper treatment system was installed to treat bright pickle drag-out. Sludge from the integrated system is recovered for sale. Rinse water consuption was reduced from 150 gpm to 10 gpm. Former discharges of chromium, ammonium, and fluoride ions have been eliminated. Cost and operating data and effluent analyses are presented.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DRE

TITLE OF PROJECT: Pollution Control of Blast-Furnace Gas Washer Through Recirculation

GRANTEE OR CONTRACTOR:

Interlake Steel Corporation
310 South Michigan Avenue
Chicago, Illinois 60604

EPA PROJECT OFFICER:

Mr. Clifford Risley
Region V, EPA
1 North Wacker Drive
Chicago, Illinois 60606

Project Site: Chicago, Illinois

DESCRIPTION OF PROJECT

Award Date: January, 1969

Completion Date: January, 1971

Project Cost: $525,600

Federal Cost: $175,200

Summary:

A system was developed and facilities were installed at Interlake, Inc., Chicago Plant, to treat, clarify, cool, and recirculate blast furnace and sinter plant wet scrubber effluents in one unified system, in order to effectively reuse these waters and eliminate their discharge into the Calumet River. Prior to recirculation of scrubber waters, the concentration of contaminants in effluents consistently exceeded Illinois code limitations with gross contaminant discharges totaling about 4,100 tons per year. The contaminant intake from the river was about 2,900 tons per year, so net contaminant discharge to the river was 1,200 tons per year. After the recycle system started operating, gross contaminant discharge decreased to 1,900 tons per year, and net discharge became a negative quantity. The construction cost of the unified recirculating system was $1,109,400 for this plant producing about 3,200 tons of hot metal and 3,300 tons of sinter per day. Operating costs are about $285,000 per year higher than the costs of operating the old "once-through" water system. Elimination of dredging costs, and increased iron recovery produce savings of about $10,000 per year, so the net increase in plant operating costs is about $275,000 per year, or $.0001 per gallon of throughput.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DRH

TITLE OF PROJECT: New Membranes for Reverse Osmosis Treatment of Metal Finishing Effluents

GRANTEE OR CONTRACTOR:

Minnesota Pollution Control Agency
717 Delaware Street, S.E.
Minneapolis, Minnesota 55440

EPA PROJECT OFFICER:

Dr. Hugh B. Durham
Grosse Ile Laboratory
9311 Groh Road
Grosse Ile, Michigan 48138

Project Site: Minneapolis, Minnesota

DESCRIPTION OF PROJECT

Award Date: May, 1971

Completion Date: April, 1972

Project Cost: $106,100 (2nd yr)

Federal Cost: $75,860 (2nd yr)

Summary:

An important new membrane was developed for the reverse osmosis treatment of both highly alkaline and acidic (non-oxidizing) metal finishing rinse waters. This membrane, designated NS-1, and originally developed for seawater desalination, consists of the following: a microporous support film (polysulfone) coated with polyethylenimine which is cross-linked with tolylene 2,4-diisocyanate. - Simulated alkaline copper and zinc cyanide plating rinses at pH's of 11.8 and 12.9 were treated by NS-1 membranes during 500- and 340-hour tests without deterioration of reverse osmosis properties. Water fluxes above 10 gallons per square foot (of membrane) per day (gfd) were observed with cyanide rejections between 95% and 99%. The NS-1 membrane also treated simulated copper sulfate rinse waters effectively at pH 0.5 during 550-hour tests without deterioration of reverse osmosis properties (fluxes above 10 gfd with 99.8% rejection of copper). The NS-1 membrane is the only known membrane that can perform well using both acidic and alkaline feed solutions. Preliminary engineering considerations indicated the feasibility of applying the NS-1 membrane to reverse osmosis treatment and recycle of nickel and zinc cyanide electroplating rinse waters.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DSA

TITLE OF PROJECT: Electroplating Waste Treatment and Water Reuse

GRANTEE OR CONTRACTOR:

S. K. Williams Company
2370 N. 32nd Street
Milwaukee, Wisconsin 53210

EPA PROJECT OFFICER:

Mr. Clifford Risley
Region V, EPA
1 North Wacker Drive
Chicago, Illinois 60606

Project Site: Milwaukee, Wisconsin

DESCRIPTION OF PROJECT

Award Date: July, 1968

Completion Date: May, 1971

Project Cost: $157,306.80

Federal Cost: $87,750.

Summary:

The S. K. Williams Company has installed a complete waste treatment system to make the wastewater effluent suitable for discharge. Included in the new plant are most of the metal finishing processes common to the industry. Despite the wide range of toxic materials used in these processes and the severely limited availability of water at the new plant, the company is now able to discharge an effluent exceeding the quality established by the USPHS for drinking water supplies. - Five integrated waste treatment systems, each designed for a specific type of waste compound, are used to protect the rinse waters from contamination by process solution dragout. A batch-type treatment system handles miscellaneous and intermittent discharges. The entire design aims for a minimum volume of sludge production, and a unique and economical sludge dewatering technique is included. Improved rinsing efficiency is achieved through the use of integrated chemical rinses, thus permitting the plant to operate on a minimum water supply. Chemical reaction efficiency was considered in the design of each phase of the treatment system to insure reduced chemical consumption and maximum economy of operation. Data listing the operating and capital costs for the entire system is presented in the final report for the project. Operating experiences are also described in the final report.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DTQ

TITLE OF PROJECT: Combined Steel Mill and Municipal Wastewaters Treatment

GRANTEE OR CONTRACTOR:

Weirton Steel Division
National Steel Corporation
P. O. Box 431
Weirton, West Virginia 26062

EPA PROJECT OFFICER:

Mr. William L. West
Wheeling Field Station, EPA
11th and Chapline Street
Wheeling, West Virginia 26063

Project Site: Weirton, West Virginia

DESCRIPTION OF PROJECT

Award Date: July, 1969

Completion Date: January, 1971

Project Cost: $163,963

Federal Cost: $95,918

Summary:

A systems evaluation was made to determine the feasibility and economics of treating selected steel mill and sanitary wastewaters in a municipal sewage treatment plant. The project was Phase I of a three-phase program to demonstrate that industry and municipalities through cooperative action can combine their wastewaters and attain their individual treatment goals in an efficient and economical manner. - Detailed field work was carried out at the steel plant and the total sewage plant treatment system. Selected steel plant wastes were combined with municipal wastes and evaluated in both batch and continuous treatability bench-scale studies. - The investigation revealed that it is technically and economically feasible to co-treat selected steel plant wastes with municipal wastewaters. A demonstration plant would further develop the specific operating procedures such as sludge concentration control, pH control, and rates of waste additions so that the process scheme could be routinely implemented in similar situations.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DUL

TITLE OF PROJECT: Limestone Treatment of Rinse Waters from Hydrochloric Acid Pickling of Steel

GRANTEE OR CONTRACTOR:

Armco Steel Corporation
Middletown, Ohio

EPA PROJECT OFFICER:

Mr. Edward Dulaney
Industrial Pollution Control
Division (RD-679), EPA
Washington, D. C. 20460

Project Site: Middletown, Ohio

DESCRIPTION OF PROJECT

Award Date: November, 1967

Project Cost: $1,784,800

Completion Date: November, 1970

Federal Cost: $547,500

Summary:

Two hydrochloric acid picklers for cleaning steel strip at Armco Steel Corporation's Middletown, Ohio Works produce up to 1,500 gpm of acid rinse waters which contain up to 0.5 g/l free hydrochloric acid and up to 0.87 g/l ferrous chloride. A facility for disposal of these rinse waters was designed based on a process developed at bench-scale by Armco research scientists. This process utilizes limestone for neutralization plus aeration and sludge recirculation to oxidize ferrous iron and form soluble calcium chloride. The final report on this project describes the investigation of process variables at pilot-scale and the optimization and demonstration of the process at full-scale. - The full-scale facility provided 100% neutralization of free acid and over 99% removal of iron using a 50% excess of limestone. A very dense, easily filtered sludge was produced. Although influent temperatures as low as 59°F were encountered, game fish populations were maintained in the treated water. Capital costs for a facility to treat 1,500 gpm acid rinse water were $1,360,000. Operating costs were 24.0c/1,000 gal. or 4.38c/ton of steel pickled.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EDY

TITLE OF PROJECT: Biological Removal of Carbon and Nitrogen Compounds from Coke Plant Wastes

GRANTEE OR CONTRACTOR:

American Iron & Steel Institute
150 East 42nd Street
New York, New York 10017

EPA PROJECT OFFICER:

Mr. Leon Myers
R. S. Kerr Environmental
Research Laboratory, EPA
P. O. Box 1198
Ada, Oklahoma 74820

Project Site: Houston, Texas

DESCRIPTION OF PROJECT

Award Date: June, 1969

Project Cost: $156,000

Completion Date: March, 1971

Federal Cost: $109,200

Summary:

A one-year study of a biological process for treatment of coke plant ammonia liquor was conducted. The process was designed to remove carbon compounds and ammonia. The pilot plant consisted of three treatment systems arranged in series. These systems were designed for the removal of carbon compounds, the oxidation of ammonia to nitrate (nitrification), and the reduction of nitrate to nitrogen gas (denitrification). The study was jointly sponsored by the American Iron and Steel Institute, the Environmental Protection Agency, and Armco Steel Corporation. - The results of the study indicate that the biological process can be used to remove carbon compounds and ammonia from dilute ammonia liquor. Treatment efficiencies obtained include removals of greater than 99.9% phenol, 80% COD and 90% ammonia. Removal efficiencies for cyanide and thiocyanate were less encouraging with averages of 57% and 17%, respectively. At this time, the inability to efficiently remove cyanide and thiocyanate raises a question as to the long range applicability of the process to existing and proposed water quality standards. - A complete evaluation of the capabilities and limitations of the system was beyond the scope of this study. Additional development work will be required before the process could be considered for commercial application.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EIE

TITLE OF PROJECT: An Investigation of Techniques for the Removal of Chromium and Cyanides from Electroplating Wastes

GRANTEE OR CONTRACTOR:

Metal Finishers' Foundation
Upper Montclair, New Jersey

EPA PROJECT OFFICER:

Mr. John Ciancia
Industrial Waste Treatment
Research Lab, EPA
Edison, New Jersey 08817

Project Site: Columbus, Ohio

DESCRIPTION OF PROJECT

Award Date: March, 1968

Project Cost: $173,141

Completion Date: April, 1971

Federal Cost: $117,699

Summary:

This report describes work which was conducted on the removal of cyanide and hexavalent chromium from plating rinse waters employing various treatment processes. The study consisted of an initial phase in which information was sought by questionnaire and by wastewater analyses on the type of waste produced by smaller electroplating plants. Laboratory studies were conducted on several nonconventional methods for treatment of these wastewaters, including ion flotation, adsorption on activated carbon, acidification volatilization, and solvent extraction. A demonstration pilot-plant study also was conducted on the activated carbon process employing actual rinse waters from a zinc cyanide plating operation. - The results of the various phases of the study indicated that activated carbon adsorption for cyanide removal may have practical application in many small plating plants. When combined with pretreatment stages for solids removal, effective elimination of heavy metals also can be expected. Further development of the process was recommended in actual plating plant installations.

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EQF

TITLE OF PROJECT: Electromembrane Process for Regenerating Acid from Spent Pickle Liquor

GRANTEE OR CONTRACTOR:

Alabama Water Improvement Commission
State Office Building
Montgomery, Alabama 36104

EPA PROJECT OFFICER:

Mr. Edmond Lomasney
Region IV, EPA
1421 Peachtree Street, N.E.
Atlanta, Georgia 30309

Project Site: Southern Research Institute, Birmingham, Alabama

DESCRIPTION OF PROJECT

Award Date: September, 1969

Project Cost: $32,000

Completion Date: November, 1970

Federal Cost: $20,000

Summary:

Studies of an electromembrane process for regenerating acid from spent sulfuric acid pickle liquor have indicated that the process is technically feasible. The studies have shown that the iron ions in spent pickle liquor can be removed and replaced by hydrogen ions to regenerate H_2SO_4 in electromembrane cells. - A method of removing iron from spent liquor that involves the formation of insoluble iron hydroxides is preferable to plating iron metal onto cathodes. - Estimated treatment costs were $0.045 ± 0.002 per gallon, whereas the combined costs of purchasing acid and disposing of spent liquor by existing methods were in the range of $0.015 to $0.06 per gallon of spent liquor. - A determination of the long-term performance of the ion exchange membranes when treating actual pickle liquors that contain organic pickling aids is needed.

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EZV

TITLE OF PROJECT: Treatment of Wastewater - Waste Oil Mixtures

GRANTEE OR CONTRACTOR:

Armco Steel Corporation
Middletown, Ohio

EPA PROJECT OFFICER:

Mr. Edward Dulaney
Industrial Pollution Control
Division (RD-679), EPA
Washington, D. C. 20460

Project Site: Ashland, Kentucky

DESCRIPTION OF PROJECT

Award Date: November, 1967

Project Cost: $1,541,720

Completion Date: June, 1970

Federal Cost: $209,000

Summary:

Cold reduction of steel strip results in the production of large quantities of wastewater containing variable amounts of oil. A five-stand tandem cold mill located at Armco Steel Corporation's Ashland, Kentucky Works produces 200 to 500 gpm of wastewater containing 400 to 4,000 ppm of oil. The COD of the waste varies from 400 to 20,000 ppm. - A treatment process and facility was developed, constructed, and demonstrated, on full scale, for the treatment of cold mill wastes. The treatment process utilized chemical coagulation to break the emulsions. The chemicals employed included alum, lime, clay, and organic polyelectrolyte. The process consisted of the following treatment steps: equilization, chemical addition and rapid mixing, flocculation, and dissolved air flotation. A number of treatment variables were studied in the laboratory and in the field in order to establish process kinetics and optimum treatment efficiency. - Oil, COD, and turbidity were used in field studies to establish the effect of the following variables on treatment efficiency: chemical concentration, order of chemical addition, chemical mixing time, flocculation mixing time and speed, and air flotation time and recirculation rate. Based on these studies, design criteria and operating costs for this process were presented.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: FNM

TITLE OF PROJECT: Recovery of Sulfuric Acid and Ferrous Sulfate From Waste Pickle Liquor

GRANTEE OR CONTRACTOR:

The Fitzsimons Steel Co., Inc.
P. O. Box 1469
1623 Wilson Ave.
Youngstown, Ohio 44501

EPA PROJECT OFFICER:

Mr. James H. Phillips
Region V, EPA
1 North Wacker Drive
Chicago, Illinois 60606

Project Site: Youngstown, Ohio

DESCRIPTION OF PROJECT

Award Date: May, 1970

Project Cost: $143,998.

Completion Date: November, 1971

Federal Cost: $39,056.50

Summary:

This grant provides for the engineering plans, installation, operation, testing, evaluation, and reporting on a full-scale facility for the elimination of 55,000 gallons per month of spent sulfuric acid pickle liquor discharge. A vacuum cooling-crystallization system will remove ferrous sulfate and concentrate the remaining acid solution for recycle to the pickling tanks. Processes for recycle or treatment of the acid rinse waters and for conversion of ferrous sulfate to other more marketable products will be evaluated. John N. Cernica and Associates, Consulting Engineers, will direct the studies and evaluations and prepare reports.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: FPK

TITLE OF PROJECT: Water Pollution Control in the Primary Nonferrous-Metals Industry - Vol I (Copper, Zinc, and Lead Industries) and Vol II (Aluminum, Mercury, Gold, Silver, Molybdenum and Tungsten).

GRANTEE OR CONTRACTOR:

Battelle Memorial Institute
505 King Avenue
Columbus, Ohio 43201

EPA PROJECT OFFICER:

Mr. John Ciancia
Industrial Waste Treatment
Research Lab, EPA
Edison, New Jersey 08817

Project Site: Columbus, Ohio

DESCRIPTION OF PROJECT

Award Date: June, 1970

Project Cost: $72,500

Completion Date: June, 1971

Federal Cost: $68,060

Summary:

This study deals with the processes and water practices in the aluminum, mercury, gold, silver, molybdenum, and tungsten industries. Data obtained from the producers of these metals showed the patterns and amounts of water usage for different purposes within these types of plants and the degrees and types of wastewater either controlled, treated, or discharged to various receiving waters. Water usage and recirculation were found to be highly variable among the individual plants, with some practices being associated with climate and water costs. This study is also concerned with the processes and water practices in the copper, lead, and zinc industries. Data supplied by 50 copper, lead, and zinc producing plants showed that wastewater control practices are influenced by climate and production processes. No wastewater is discharged from many operations in the Southwestern desert area. About two-thirds of the wastewaters discharged by the balance of the plants were from ponds and exhibited neutral to alkaline pH. In some cases, these wastewaters contained "trace" amounts of heavy metals.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: FXD

TITLE OF PROJECT: Reclamation of Metal Values from Metal Finishing Waste Treatment Sludges

GRANTEE OR CONTRACTOR:

Metal Finishers' Foundation
248 Lorraine Avenue
Upper Montclair, New Jersey

EPA PROJECT OFFICER:

Mr. Eugene Harris
NERC, EPA
Cincinnati, Ohio 45268

Project Site: Columbus, Ohio

DESCRIPTION OF PROJECT

Award Date: October, 1970

Completion Date: October, 1972

Project Cost: $99,970

Federal Cost: $90,069

Summary:

The efforts of this program have included the determination of the worth of recovering metal values from metal finisher's wastewater treatment sludges, the definition and research of processes for such recovery, and the selection, design, and costing of a recommended process. - The study included a survey of the literature to determine the state-of-the-art regarding the generation, disposal, and recovery treatment practices relevant to metal-finishers' sludges, and to identify metal recovery processes possibly applicable to those sludges. This information was supplemented with a survey by questionnaire to determine the current status of relevant practices and conditions. - Field investigations provided detailed examples of plant practices, sludge storage conditions, and sludge characteristics such as water content and chemical composition. Further, a detailed study was performed to determine, for one lagoon, the degree of leaching of metals from the sludge into the underlying soil structure. Samples of sludge were obtained from operating plants for use in the experimental program. On the basis of the information developed in the prior portions of the program, a portable pilot process for the treatment of waste sludges and recovery of metal values was selected and equipment and operating costs developed.

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This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: GCS

TITLE OF PROJECT: Destruction of Cyanide Wastes by an Electrochemical Redox Process

GRANTEE OR CONTRACTOR:

Aerodex, Inc.
P. O. Box 123 MIAD
Miami, Florida 33148

EPA PROJECT OFFICER:

Mr. Edmond Lomasney
Region IV, EPA
1421 Peachtree Street, N.E.
Atlanta, Georgia 30309

Project Site: Miami, Florida

DESCRIPTION OF PROJECT

Award Date: February, 1971

Project Cost: $183,841

Completion Date: July, 1973

Federal Cost: $85,072

Summary:

This project is planned to culminate in a full-scale (250 gpm) demonstration facility for the electrochemical destruction of cyanide in wastes from electroplating operations. Phase I provides for optimization of parameters in a 600-gallon batch system. Phase II will consist of the design of a continuous system based on the data and conclusion from Phase I. Phase III will consist of construction, operation, testing, evaluation, and reporting on the effectiveness and economics of the continuous flow demonstration facility.

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: GUG

TITLE OF PROJECT: Electrolytic Treatment of Job Shop Metal Finishing Wastewaters

GRANTEE OR CONTRACTOR:

New England Plating Co., Inc.
31 Garden Street
Worcester, Massachusetts 01605

EPA PROJECT OFFICER:

Mr. John Ciancia
Industrial Waste Treatment
Research Lab, EPA
Edison, New Jersey 08817

Project Site: Worcester, Massachusetts

DESCRIPTION OF PROJECT

Award Date: April, 1971

Completion Date: December, 1972

Project Cost: $392,252

Federal Cost: $119,424

Summary:

Production studies demonstrated the reliability and economics of electrolytic cells containing beds of conductive particles between cathodes and anodes for reduction of hexavalent chromium and oxidation of cyanide in plating rinse water. - Seventy-five liter/min (20 GPM) sized cells were employed for chromium and cyanide rinses. Chromium concentrations to 250 mg/liter and cyanide concentrations to 150 mg/liter were processed. Data were obtained with parallel equipment using chemical treatment for cost comparison. - At low chromium concentrations (less than 25 mg/liter), chemical reduction was more economical. At higher concentrations (150 mg/liter), electrolytic reduction became the more economical process. In cyanide oxidation, the electrochemical process reduced direct costs associated with chlorination. - Waste treatment costs, capital and operating, for the job shop are provided with an assessment of total costs on the price of services provided. Water conservation techniques are described. Experiences with tube settling equipment for removal of suspended solids and centrifuge for sludge concentration is provided.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: GVV

TITLE OF PROJECT: Recovery of Chromic Acid and Nickel From Plating Wastes

GRANTEE OR CONTRACTOR:

Michigan Plating & Stamping Co.
740 Ann Avenue, N.W.
Grand Rapids, Michigan 49502

EPA PROJECT OFFICER:

Dr. Hugh B. Durham
Grosse Ile Field Station
9311 Groh Road
Grosse Ile, Michigan 48138

Project Site: Grand Rapids, Michigan

DESCRIPTION OF PROJECT

Award Date: March, 1971

Project Cost: $1,038,198

Completion Date: November, 1972

Federal Cost: $170,061

Summary:

This bumper plating plant is installing integrated waste treatment systems to treat nickel and chromium plating bath dragout. This grant provides for the installation, operation, testing, evaluation, and reporting on the heavy metals recovery and water reuse systems to be installed. The electrolytic nickel recovery system is expected to recover 250 pounds of nickel per day from the integrated treatment system sludges and plating bath purification system carbons. The chromate system is expected to recover 350 pounds of chromic acid per day by the continuous flow of concentrated rinse waters from a save-rinse tank through an induced draft evaporative tower. Chromium dragout from the save-rinse tank will be reduced and precipitated in the integrated chrome treatment system. This combination system allows appreciable acid recovery, sufficient acid dragout to maintain plating bath purity, and a very low chromium concentration in the plant effluent. The evaporative tower will also receive, concentrate, and recover acid from the chrome-plating line fume scrubbing system waters. The installation is expected to demonstrate the capability of the tower to simultaneously serve as a fume scrubber and as an acid concentrating and recovering system.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: HGH

TITLE OF PROJECT: Treatment and Recovery of Fluoride Industrial Wastes

GRANTEE OR CONTRACTOR:

Grumman Aerospace Corp.
Bethpage, New York 11714

EPA PROJECT OFFICER:

Mr. John Ciancia
Industrial Waste Treatment
Research Lab, EPA
Edison, New Jersey 08817

Project Site: Bethpage, New York

DESCRIPTION OF PROJECT

Award Date: December, 1971

Completion Date: November, 1972

Project Cost: $55,978

Federal Cost: $34,922

Summary:

This report presents the development and successful demonstration of laboratory and pilot-scale fluoride treatment techniques for selected aerospace and metal-working industry chemical processing solutions and rinse waters. It includes laboratory-scale, lime treatment parameters for chemical processing solutions such as temperature, retention time, pH, slurry concentration, and fluoride influent and effluent levels, and ion-exchange treatment techniques to reduce the fluoride concentration of rinse waters to levels less than three parts per million. - Pilot studies of centrifugal techniques to separate lime-precipitated sludges from titanium chemical milling, titanium descaling and aluminum deoxidizing solutions show that lime precipitation can give final effluents having fluoride concentrations less than three parts per million. Aluminum conversion coating solutions, however, require secondary treatment with aluminum sulfate to give final effluents having fluoride concentrations less than three parts per million. Chemical and mechanical property tests show that it is potentially feasible to use calcium fluoride sludge as a strength-maintaining additive for concrete. The reuse of treated rinse waters, the economics of precipitation, and production plans for chemical processing solutions and rinse waters are also presented.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: HOW

TITLE OF PROJECT: Treatment of Coke Plant Waste Liquor

GRANTEE OR CONTRACTOR:

Alan Wood Steel Company
Conshohocken, Pa. 19428

EPA PROJECT OFFICER:

Dr. Hugh B. Durham
Industrial Waste Research Program
Environmental Protection Agency
Grosse Ile, Michigan 48138

Project Site: Conshohocken, Pa.

DESCRIPTION OF PROJECT

Award Date: December 1971

Project Cost: $2,105,050

Completion Date: September 1973

Federal Cost: $352,652

Summary:

This project will demonstrate, in a full-scale (180,000 gpd) system, complete treatment of by-product coke plant wastes. The treatment consists of steam stripping of ammonia and phenol, multi-stage flash evaporation, and polishing the condensed effluent with activated carbon. The treated effluent will be a high quality water which can be used for boiler feedwater or cooling water make-up. An incinerator will receive all the vapors and the final concentrate from the evaporator system, producing a scrubbed gas suitable for discharge to the atmosphere and an ash to be disposed of by landfill.

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: HQJ

TITLE OF PROJECT: Membrane Processes for Treating Metal Finishing Wastes

GRANTEE OR CONTRACTOR:

American Electroplaters' Society Inc.
56 Melmore Gardens
East Orange, New Jersey 07017

EPA PROJECT OFFICER:

Mr. John Ciancia
Industrial Waste Treatment
Research Laboratory, IPCB
Edison, New Jersey 08817

Project Site: Cambridge, Massachusetts

DESCRIPTION OF PROJECT

Award Date: October, 1971

Project Cost: $120,406

Completion Date: January, 1973

Federal Cost: $114,386

Summary:

Reverse osmosis and ultrafiltration are new approaches that show promise as attractive alternatives to existing methods for treating metal finishing wastes. The overall objective of this project is to develop and then demonstrate a reverse osmosis/ultrafiltration system in a metal finishing plant. The study will evaluate the technical feasibility and economics of the new process for treating rinse water from a metal finishing operation by recovery of the chemicals in a concentrated solution for return to the bath while simultaneously purifying the water for reuse in rinsing. Where necessary, the investigation will also include the removal of impurity build-up in the concentrated solution returned to the bath.

The development phase of the project will involve testing commercially available membranes and equipment configurations in modular pilot plant facilities using various types of rinse waters. On the basis of this investigation, a system will be selected for treating a specific type of rinse water and will be demonstrated in a commercial shop.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: PPB

TITLE OF PROJECT: Management of Recycled Waste-Process Water Ponds

GRANTEE OR CONTRACTOR:

Dr. Charles E. Renn
Dept. of Environmental
Engineering Science
The Johns-Hopkins University
Baltimore, Maryland 21218

EPA PROJECT OFFICER:

Dr. Herbert Skovronek
Industrial Waste Treatment
Research Lab, EPA
Edison, New Jersey 08817

Project Site: Hampstead, Maryland

DESCRIPTION OF PROJECT

Award Date: December, 1967

Completion Date: November, 1968

Project Cost: $180,921 (3rd yr)

Federal Cost: $39,627 (3rd yr)

Summary:

This study describes the successful operation of a storage pond used to collect treated wastewaters and runoff for recycle to manufacturing operations under conditions of drought and severe water shortages. Treated sewage and cafeteria wastes are stored in an air sparger mixed pond and are returned to the manufacturing plant to provide water for evaporative cooling and a variety of production processes. By applying long term storage, air sparger agitation, and controlled stratification during the summer, it has been possible to increase the effectiveness of limited well supplies from six to fifteen times. - The efficiency of the pond depends in large part upon biological processes that go on in the comparatively shallow areas of the system. These act to capture phosphorus and to stabilize algal organics generated in the pond itself.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: WPRD 41

TITLE OF PROJECT: Acid Pickle Liquor Wastes Treatment Utilizing Advanced Ion Exchange Techniques

GRANTEE OR CONTRACTOR:

Chemical Separations Corporation
Bus Terminal Road
Oak Ridge, Tennessee 37830

EPA PROJECT OFFICER:

Dr. Hugh B. Durham
Grosse Ile Lab
Environmental Protection Agency
Grosse Ile, Michigan 48138

Project Site: Oak Ridge, Tennessee

DESCRIPTION OF PROJECT

Award Date: December, 1967

Project Cost: $72,000

Completion Date: March, 1969

Federal Cost: $50,400

Summary:

The purpose of this grant was to determine the feasibility of using continuous ion exchange to strip Fe from pickling wastes and regenerate the acid for reuse.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 800625

TITLE OF PROJECT: Water Pollution Control Practices in the Carbon and Alloy Steel Industries

GRANTEE OR CONTRACTOR:

Attorney General of Illinois
160 N. LaSalle Street
Chicago, Illinois 60601

EPA PROJECT OFFICER:

Dr. Hugh Durham
Grosse Ile Field Station
9311 Groh Road
Grosse Ile, Michigan 48138

Project Site: Pittsburgh, Pa.

DESCRIPTION OF PROJECT

Award Date: April, 1972

Project Cost: $45,000

Completion Date: November, 1972

Federal Cost: $42,750

Summary:

The objectives of this project were to refine, complete, and extend the data and coverage developed by C. W. Rice Division of NUS Corporation under Contract 68-01-0006 and contained in the report entitled "Industrial Profile Study on Blast Furnace and Basic Steel Products" and to prepare a similar report on the alloy steel industry.

The Attorney General of Illinois proposes to engage Datagraphics, Inc. to carry out this task.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 800680

TITLE OF PROJECT: Treatment and Recoverv of Fluoride and Nitrate Industrial Wastes

GRANTEE OR CONTRACTOR:

Grumman Aerospace Corp.
Bethpage, New York 11714

EPA PROJECT OFFICER:

Dr. Hugh Durham
Grosse Ile Laboratory, EPA
9311 Groh Road
Grosse Ile, Michigan 48138

Project Site: Bethpage, New York

DESCRIPTION OF PROJECT

Award Date: December, 1971

Project Cost: $134,896

Completion Date: September, 1975

Federal Cost: $96,127

Summary:

During Phase I of this project fluoride treatment techniques of laboratory and pilot-scale were conducted on selected aerospace and metal working industry chemical processing solutions and rinse waters. Ion exchange techniques were established for the treatment of fluoride containing rinse waters to levels less than three parts per million. - Pilot studies were conducted using centrifugal techniques to separate lime precipitated sludges. These tests showed that lime precipitation could reduce fluoride levels in titanium chemical milling and descaling solutions and aluminum deoxidizing solutions to less than three parts per million in the final effluent. - The feasibility of using calcium fluoride sludge as a strength maintaining additive for concrete was established by chemical and mechanical tests. - The technology developed in Phase I of this project has strengthened the conviction that further studies would significantly benefit these chemical treatment processes of rinse waters. Phase II will have as its objectives the development of comprehensive waste treatment technology for the removal of nitrates from lime treatment effluents and the economics of sludge reuse, water recycling and production scale-up. Pilot studies will be carried out to determine parameters for using ion exchange as a means to remove fluorides and nitrates from metal treatment process solution rinse waters.

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 800772

TITLE OF PROJECT: Treatment of Coke Plant Waste Liquor

GRANTEE OR CONTRACTOR:

Alan Wood Steel Company
Conshohocken, Pennsylvania 19428

EPA PROJECT OFFICER:

Dr. Hugh Durham
Grosse Ile Laboratory
9311 Groh Road
Grosse Ile, Michigan 48138

Project Site: Conshohocken, Pennsylvania

DESCRIPTION OF PROJECT

Award Date: December, 1971

Project Cost: $2,010,100.

Completion Date: June, 1975

Federal Cost:

Summary:

The objective of the project is to demonstrate the technical and economic feasibility of a chemical, thermal, physical waste treatment process to treat the coke plant waste liquor stream. - The coke plant waste liquor stream from the Alan Wood Steel Company's Conshohocken, Pennsylvania plant contains a variety of waste contaminants including suspended solids, dissolved organics, cyanide, ammonia, phenols, etc. The treatment processes to be employed to remove the waste contaminants and prepare the 125 gpm of waste water to meet stream objectives will include stripping of ammonia, concentration by six effect multistage evaporator, stripping of phenols, biological treatment of phenols, disposal by incineration. The product water is to be reused in a closed cooling tower system to alleviate thermal pollution from cooling waters in the coke plant. - Laboratory evaluations and pilot plant tests will be conducted to obtain basic design parameters for the entire treatment sequence. A treatment system will be constructed to treat 180,000 gallons/day of waste water. Post-construction studies will be conducted to verify the treatment plant design parameters and to establish an accurate estimate of the economics involved with the treatment process and the treatment effectiveness.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 801989

TITLE OF PROJECT: Demonstration and Evaluation of Countercurrent Rinsing for Reducing Pollution from a Halogen Tinplating Line

GRANTEE OR CONTRACTOR:

Weirton Steel Division
Division of National Steel Corp.
Weirton, West Virginia 26062

EPA PROJECT OFFICER:

Dr. Hugh Durham
Grosse Ile Laboratory
9311 Groh Road
Grosse Ile, Michigan 48138

Project Site: Weirton, West Virginia

DESCRIPTION OF PROJECT

Award Date: March, 1973

Completion Date: May, 1976

Project Cost: $318,454

Federal Cost: $165,686

Summary:

The primary objective of this project is to upgrade the state-of-the-art of pollution control of a halogen tinplating line dragout rinse. Hopefully, this project will result in a process which will have a zero discharge from the halogen dragout rinse. The project involves the use of countercurrent rinsing on the primary dragout rinse tank of a high speed Halogen tinplating line. In the current operation the strip is submersed in a tank of water and the strip moves countercurrent to the movement of water. The resulting discharge is large in volume and low in concentration of plating solution. The proposed system is a multi-state counter-current rinse tank. The strip is not submersed but travels over the tanks. Fresh water is fed into the exit end of the tank. As the strip passes from stage to stage it sees a less concentrated rinse water. The resulting discharge will then be reused as makeup in the plating cells. The project objectives include: 1) To demonstrate on a full-scale production line that countercurrent rinsing in the primary dragout tank with subsequent reuse of the blowdown as makeup in the plating is applicable through the use of AA-40 additive to minimize sludge buildup. 2) Complete recycle of discharge to realize a zero discharge or to minimize discharge.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 802113

TITLE OF PROJECT: Chromium Removal

GRANTEE OR CONTRACTOR:
Metal Finishers' Foundation
248 Lorraine Avenue
Upper Montclair, New Jersey 07043

EPA PROJECT OFFICER:
Mr. John Ciancia
Industrial Waste Treatment
Research Laboratory, IPCB
Edison, New Jersey 08817

Project Site: Columbus, Ohio

DESCRIPTION OF PROJECT

Award Date: February 7, 1973

Project Cost: $31,858

Completion Date: August, 1973

Federal Cost: $22,000

Summary:

The objectives of this project are to optimize the regeneration of a recently developed carbon bed chromate removal process and then evaluate the practical and economic feasibility of the technique including reuse of the treated water. The relative effectiveness of alternate regeneration procedures will be determined by conducting bench-scale experiments in the laboratory. The optimum regeneration procedure will be used in a pilot plant demonstration in a plating shop to establish the effectiveness and economic feasibility of the process, as well as investigate the extent the treated water can be reused for rinsing.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 802142

TITLE OF PROJECT: Regeneration of Hydrochloric Acid Waste Pickle Liquor

GRANTEE OR CONTRACTOR:

Toledo Pickling and Steel
Service, Inc.
1149 Campbell Street
Toledo, Ohio 43607

EPA PROJECT OFFICER:

Dr. Hugh Durham
Grosse Ile Field Station
9311 Groh Road
Grosse Ile, Michigan 48138

Project Site: Toledo, Ohio

DESCRIPTION OF PROJECT

Award Date: March, 1973

Completion Date: July, 1975

Project Cost: $383,161

Federal Cost: $222,088.

Summary:

The principal objective of this project is to demonstrate in a plant scale continuous operation the technical and economic feasibility of using the Environmental Technology, Inc., process and equipment for the recovery and regeneration of waste hydrochloric acid pickle liquor in a closed-loop system in which no noxious pollutants escape into the environment. The process employs thermal degradation of ferrous chloride to hydrogen chloride gas and ferric oxide. The waste pickle liquor consisting primarily of aqueous ferrous chloride, with some unreacted hydrochloric acid, is sprayed onto a vibrating fixed bed of ferric oxide, in an oxidizing atmosphere. The process is expected to yield 18-20% hydrochloric acid for recycling and ferric oxide of any desired particle size.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 802254

TITLE OF PROJECT: Metallic Recovery from Wastewaters Utilizing Cementation

GRANTEE OR CONTRACTOR:

Anaconda American Brass Company
Engineer Environments Division
Waterbury, Connecticut 06720

EPA PROJECT OFFICER:

Mr. Richard B. Tabakin
Industrial Waste Treatment
Research Laboratory, IPCB
Edison, New Jersey 08817

Project Site: Waterbury, Connecticut

DESCRIPTION OF PROJECT

Award Date: March, 1973

Project Cost: $20,765

Completion Date: September, 1973

Federal Cost: $14,535

Summary:

The purpose is to investigate on a bench-scale the simultaneous reduction of Cr^{+6} and the precipitation reduction of Cu^{+2} in acid solution by contact with sacrificial metals such as, but not limited to, iron. Scale-up to full size of previous brief bench scale flow experiments was disappointing (poor copper recovery from brass mill waste streams). The aim of the proposed work is to identify those factors such as mass transport and chemical mechanisms which govern effectiveness and to describe their operation, with the view of making rational improvements in full scale application.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 802335

TITLE OF PROJECT: Ozone Treatment of Plating Wastewaters Containing Cyanide

GRANTEE OR CONTRACTOR:

Sealectro Corporation
Mamaroneck, New York 10543

EPA PROJECT OFFICER:

Dr. Herbert S. Skovronek
Industrial Waste Treatment
Research Laboratory, IPCB
Edison, New Jersey 08817

Project Site: Mamaroneck, New York

DESCRIPTION OF PROJECT

Award Date: March, 1973

Project Cost: $77,900

Completion Date: December, 1973

Federal Cost: $37,000

Summary:

The principal objective is to demonstrate in a full-scale system the effectiveness of the ozonation process for the treatment of plating wastes containing cyanide. Further objectives are to optimize the key process parameters, establish operating and capital costs and explore the possibility of producing treated effluent that would meet Federal standards.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 802390

TITLE OF PROJECT: Precipitation of Iron from Acidic Process Liquors

GRANTEE OR CONTRACTOR:

University of Arizona
Tucson, Arizona 85721

EPA PROJECT OFFICER:

Mary K. Stinson
Industrial Waste Treatment
Research Laboratory, IPCB
Edison, New Jersey 08817

Project Site: Tucson, Arizona

DESCRIPTION OF PROJECT

Award Date: April, 1973

Completion Date: March, 1975

Project Cost: $39,175

Federal Cost: $30,000

Summary:

The purpose of this study is to investigate on a bench scale the hydrolysis-crystallization kinetics of solid ferric oxide compounds from acidic solutions of ferrous sulfate containing other metallic ions. The rates are known to be temperature dependent: a major goal is to determine whether special crystallization techniques can be employed to attain industrially useful rates with temperatures at or below 100°C. Solutions of the type proposed for study are generated in large quantities by acid leaching of copper ores. Successful precipitation of the iron can contribute to regeneration of acid and greater recycle potential.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 802637-01

TITLE OF PROJECT: Phosphoric Acid Recovery System--Phase I
Process Optimization and Feasibility Study

GRANTEE OR CONTRACTOR:

Douglas & Lomason Corporation
5800 Lincoln Avenue
Detroit, Michigan 48208

EPA PROJECT OFFICER:

Mr. John Ciancia
Industrial Waste Treatment
Research Laboratory, IPCB
Edison, New Jersey 08817

Project Site: Detroit, Michigan

DESCRIPTION OF PROJECT

Award Date: June, 1973

Completion Date: October, 1973

Project Cost: $66,500

Federal Cost: $45,000

Summary:

The objective of this study is to demonstrate the effectiveness and economics of a novel process for recovering phosphoric acid from bright finishing solutions used in the preparation of aluminum. The process will remove aluminum contamination from the waste phosphoric acid, thereby permitting reuse of the acid in the bright dipping operation. A pilot plant investigation will be conducted to optimize the operating variables of the process. An economic projection based on an engineered system will then be made to permit a detailed evaluation of the process prior to construction of the full-scale facility. The new approach will also be compared with presently available alternative waste treatment methods.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 802637-02

TITLE OF PROJECT: Phosphoric Acid Recovery System - Phase II Installation and Operation of Prototype System

GRANTEE OR CONTRACTOR:

Douglas & Lomason Company
5800 Lincoln Avenue
Detroit, Michigan 48208

EPA PROJECT OFFICER:

Mary K. Stinson
Industrial Waste Treatment
Research Laboratory, IPCB
Edison, New Jersey 08817

Project Site: Cleveland, Mississippi

DESCRIPTION OF PROJECT

Award Date: June, 1974

Project Cost: $288,382

Completion Date: July, 1975

Federal Cost: $55,000

Summary:

This project is the second phase of a study to develop and demonstrate novel technology for recovering spent phosphoric acid from bright finishing solutions used in the preparation of aluminum. The proposed system uses an anion exchange resin as an acid adsorption medium in a continuous countercurrent contractor. The anion exchange resin accomplishes the separation by retarding the phosphoric acid as the processing solution flows through the bed. The aluminum remains in the solution and passes out the column in the effluent. The phosphoric acid is eluted from the resin by water, thus eliminating the need for chemicals to regenerate the resin.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 802924

TITLE OF PROJECT: Treatment of Metal Finishing Wastes by Sulfide Precipitation

GRANTEE OR CONTRACTOR:

Metal Finishers' Foundation
248 Lorraine Avenue
Upper Montclair, New Jersey 07043

EPA PROJECT OFFICER:

Mr. John Ciancia
Industrial Waste Treatment
Research Laboratory, IPCB
Edison, New Jersey 08817

Project Site: South Brunswick Township, New Jersey

DESCRIPTION OF PROJECT

Award Date: April, 1974

Project Cost: $33,600

Completion Date: January, 1975

Federal Cost: $30,000

Summary:

A pilot plant investigation will be carried out to optimize and evaluate the economic feasibility of a recently developed sulfide precipitation process for removing heavy metals from metal finishing wastes. This unique sulfide precipitation technique is a highly effective process which can reduce the heavy metal content of wastes down to extremely low levels with essentially no excess of sulfide in the effluent.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 803064

TITLE OF PROJECT: Regeneration of Chromated Aluminum Deoxidizers: Phase II - Improved Diaphragms

GRANTEE OR CONTRACTOR:

The Boeing Commercial Airplane Co.
P. O. Box 3707
Seattle, Washington 98124

EPA PROJECT OFFICER:

Dr. Hugh Durham
Grosse Ile Field Station
9311 Groh Road
Grosse Ile, Michigan 48138

Project Site: Seattle, Washington

DESCRIPTION OF PROJECT

Award Date: August, 1971

Project Cost: $89,853

Completion Date: April, 1975

Federal Cost: $37,203.

Summary:

In the regeneration process for chromated aluminum deoxidizers as conducted in the original work of Project HEK, it is necessary to use a chemically inert, electrically conductive diaphragm separating positive and negative electrodes. Such a diaphragm was developed during the program.

The fabrication method for these early diaphragms is costly and life expectancy is short. This continuation contract proposes to improve cost and performance of the diaphragms in order to make them commercially attractive for general job shop use.

Results of Phase I is published under EPA Report EPA-660/2-73-023.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 803073

TITLE OF PROJECT: Aircraft Factory Waste Water Recycling-Pilot Scale Demonstration

GRANTEE OR CONTRACTOR:

The Boeing Commercial Airplane Co.
P. O. Box 3707
Seattle, Washington 98124

EPA PROJECT OFFICER:

Dr. Hugh Durham
Grosse Ile Field Station
9311 Groh Road
Grosse Ile, Michigan 48138

Project Site: Seattle, Washington

DESCRIPTION OF PROJECT

Award Date: July, 1974

Project Cost:

Completion Date: July, 1976

Federal Cost:

Summary:

The objective of this project is a pilot scale demonstration of treatment and recycle of four dilute wastewater streams resulting from aircraft manufacture. The streams involved are: 1) Chemical process rinses, for which both in-exchange and reverse osmosis are to be tried; 2) Dye penetrant rinse water, to be treated by activated carbon adsorption; 3) Cyanide-containing rinses, to be treated by electrolytic destruction, and 4) Cutting oil emulsion waste, for which ultrafiltration is to be demonstrated.

After installation, there will be a six-month optimization period, at the end of which a decision will be made between in-exchange and reverse osmosis for treatment of chemical process rinses. There will then be a 9 month period of continuous operation to demonstrate operation under actual plant conditions, and to determine if there would be any buildup of undesirable contaminants. Both recurring and non-recurring costs of a full-scale recycling plant will be determined.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 803177

TITLE OF PROJECT: Recycling of Industrial Wastewater Containing Cyanide, Chromium, and Other Toxic Material

GRANTEE OR CONTRACTOR:

The Singer Company
321 First Street
Elizabeth, New Jersey 07207

EPA PROJECT OFFICER:

Mary K. Stinson
Industrial Waste Treatment
Research Laboratory, IPCB
Edison, New Jersey 08817

Project Site: Elizabeth, New Jersey

DESCRIPTION OF PROJECT

Award Date: June, 1974

Project Cost: $324,080

Completion Date: July, 1975

Federal Cost: $29,000

Summary:

This project will demonstrate a full scale closed-loop system for the treatment of wastewaters arising from deburring, burnishing, stripping, and electroplating operations at a metal finishing plant. The treatment consists of ultrafiltration for the removal of oil, a three BOD ion exchange system (strongly acidic, weakly basic and strongly basic) for the removal of cyanide and heavy metals from rinse water, and chemical treatment of the ion exchange regenerant solutions and concentrated process wastes.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 803226

TITLE OF PROJECT: Study of Copper Recovery from Brass Mill Discharge by Cementation with Scrap Iron in Full Scale

GRANTEE OR CONTRACTOR:

Anaconda American Brass Company
P. O. Box 830
Waterbury, Connecticut 06720

EPA PROJECT OFFICER:

Mr. Richard B. Tabakin
Industrial Waste Treatment
Research Laboratory, IPCB
Edison, New Jersey 08817

Project Site: Waterbury, Connecticut

DESCRIPTION OF PROJECT

Award Date: June, 1974

Completion Date: January, 1975

Project Cost: $29,234

Federal Cost: $20,000

Summary:

This project will demonstrate simultaneous reduction of Cr (VI) and the precipitation-reduction of Cu (II) in acid solution by cementation onto sacrificial scrap iron. The mass transport and chemical mechanisms governing the effectiveness of the cementation reaction which were identified in a bench scale study, EPA Project 802254, will be verified in this full scale inplant demonstration at a brass mill.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the
Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 803261

TITLE OF PROJECT: In-Plant Pilot Program for Treatment, Concentration and Recovery of Phosphate Cleaning Wastes from Aluminum Finishing Operations

GRANTEE OR CONTRACTOR:

Aluminum Company of America
1200 Ring Building
Washington, D. C. 20036

EPA PROJECT OFFICER:

Mary K. Stinson
Industrial Waste Treatment
Research Laboratory, IPCB
Edison, New Jersey 08817

Project Site: Newburgh, Indiana

DESCRIPTION OF PROJECT

Award Date: June, 1974

Project Cost: $134,220

Completion Date: July, 1975

Federal Cost: $36,000

Summary:

This project will demonstrate a pilot plant scale treatment of dilute, phosphates bearing rinsewaters, which result from aluminum cleaning operations. The process will utilize a recently developed unique evaporative system to produce high quality water and concentrate the phosphate in the rinsewater by effecting a 97-99% reduction in the initial wastewater volume. Low pressure steam, produced by the plant waste heat, will be used as the heat source for the evaporation process, and about 80% of the steam heat can be recovered for further utilization. A closed loop type system is possible.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 803264

TITLE OF PROJECT: New Membrane for Treatment of Metal Finishing Effluents by Reverse Osmosis

GRANTEE OR CONTRACTOR:

American Electroplaters' Society, Inc.
56 Melmore Gardens
East Orange, New Jersey

EPA PROJECT OFFICER:

Mr. Donald L. Wilson
Industrial Waste Treatment
Research Laboratory, NERC, EPA
Cincinnati, Ohio 45268

Project Site:

DESCRIPTION OF PROJECT

Award Date: June, 1974

Completion Date: April, 1975

Project Cost: $26,315

Federal Cost: $25,000

Summary:

The objective of this project is to complete the development of a new and improved reverse osmosis membrane by optimizing the fabrication procedure and establishing the sustained performance capabilities of the advanced membrane for treating metal finishing wastewaters. The new membrane was shown to provide effective treatment of highly acidic and alkaline metal finishing wastes beyond the range of presently available reverse osmosis membranes in short term testing during a previous grant.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 803265

TITLE OF PROJECT: Zinc Sludge Recycling from Kastone Treatment Process

GRANTEE OR CONTRACTOR:

Metal Plating Corporation
1740 Georgia Avenue
Connersville, Indiana 47331

EPA PROJECT OFFICER:

Mr. Donald L. Wilson
Industrial Waste Treatment
Research Laboratory, NERC, EPA
Cincinnati, Ohio 45268

Project Site: Connersville, Indiana

DESCRIPTION OF PROJECT

Award Date: June, 1974

Project Cost: $31,258

Completion Date: July, 1975

Federal Cost: $15,000

Summary:

The project involves an in-plant demonstration of zinc sludge recycling from the Kastone waste treatment process. DuPont's Kastone process uses a specially formulated grade of hydrogen peroxide to oxidize cyanide to cyanate and precipitate the heavy metals in metal finishing rinsewaters. This study will apply sludge recycling to return the zinc precipitated in the Kastone process back into the plating operation.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 803304

TITLE OF PROJECT: Evaluation Under Plant Conditions of Electrodialysis of Cyanide Rinsewaters--Zero Discharge

GRANTEE OR CONTRACTOR:

Keystone Lamp Manufacturing Corporation
Route 873
Slatington, Pennsylvania 18080

EPA PROJECT OFFICER:

Mr. John Ciancia
Industrial Waste Treatment
Research Laboratory, IPCB
Edison, New Jersey 08817

Project Site: Slatington, Pennsylvania

DESCRIPTION OF PROJECT

Award Date: June, 1974

Project Cost: $44,898

Completion Date: January, 1975

Federal Cost: $15,000

Summary:

This study involves a full scale inplant demonstration of the use of electrodialysis to purify a brass cyanide rinse water for reuse while concentrating the chemicals for return to the processing bath. The purpose of this study is to establish the effectiveness and economics of using electrodialysis for closing the loop on cyanide rinse wastes under actual plant conditions.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the
Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 803332

TITLE OF PROJECT: Removal of Toxic Metal Ions from Metal Finishing Wastewater by Solvent Extraction

GRANTEE OR CONTRACTOR:

Texas Southern University
Department of Chemistry
3201 Wheeler Avenue
Houston, Texas 77004

EPA PROJECT OFFICER:

Mr. Richard B. Tabakin
Industrial Waste Treatment
Research Laboratory, IPCB
Edison, New Jersey 08817

Project Site: Houston, Texas

DESCRIPTION OF PROJECT

Award Date: August, 1974

Project Cost: $84,186

Completion Date: December, 1975

Federal Cost: $79,974

Summary:

The primary objective of this project is to develop solvent extraction processes in the laboratory which show promise of being scaled up for utilization by small metal plating shops to remove and recover toxic metals ions from wastewaters. The methods will be developed for removal of copper, cadmium, chromium, nickel, and zinc using high molecular weight amines including Primene JM-T, Amberlite LA-I, Alamine 336-S. Attempts will be made at selective removal of metals and application of the approach to sludges. Emphasis will be placed on developing simple, economical methods. A cost analysis will be included.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 803342

TITLE OF PROJECT: Heavy Metals Removal Process

GRANTEE OR CONTRACTOR:

Metal Finishers' Foundation
248 Lorraine Avenue
Upper Montclair, New Jersey 07043

EPA PROJECT OFFICER:

Fred Ellerbusch
Industrial Waste Treatment
Research Laboratory, IPCB
Edison, New Jersey 08817

Project Site: Bell Gardens, California

DESCRIPTION OF PROJECT

Award Date: June, 1974

Project Cost: $50,000

Completion Date: May, 1975

Federal Cost: $30,000

Summary:

The project is a pilot scale demonstration of an electrolytic technique for removing heavy metals and cyanide from metal finishing wastes. The removal system uses a bed of conductive particles between the electrodes through which the waste to be treated flows. A low voltage direct current is applied resulting in the plating out of the heavy metals on the conductive particles. The metal removed can be recovered either chemically or electrochemically.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH. DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 803467

TITLE OF PROJECT: Metal Finishing: Painting Waste Load Study

GRANTEE OR CONTRACTOR:

Dr. George E. F. Brewer
Brighton, Michigan

EPA PROJECT OFFICER:

Dr. Hugh Durham
Grosse Ile Field Station
9311 Groh Road
Grosse Ile, Michigan 48138

Project Site: Brighton, Michigan

DESCRIPTION OF PROJECT

Award Date: November, 1974

Project Cost: $17,349

Completion Date: December, 1975

Federal Cost: $16,481

Summary:

A state-of-the-art survey will be conducted on the liquid, solid, and gaseous waste loads generated during industrial painting processing. Four available classes of paints (organic solvent-borne, water-borne, powder paints, and radiation cured paints), applied by one or more of six painting techniques (spray, dip and flow, roller and brush, electrodeposition, powder technology, and radiation curing) are being surveyed. Data are being obtained from the literature, trade and scientific organizations, paint and equipment manufacturers, and industrial users.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

FINAL REPORTS AVAILABLE

METAL AND METAL PRODUCTS

Report Number	Title/Author	Source
12010 EIE 11/68	A State-of-the-Art Review of Metal Finishing Waste Treatment, Battelle Memorial Institute, Columbus, Ohio.	GPO $1.00
12010 EIE 03/71	An Investigation of Techniques for Removal of Chromimum from Electroplating Wastes, Battelle Memorial Institute, Columbus, Ohio.	GPO $1.00
12010 EZV 02/70	Treatment of Waste Water - Waste Oil Mixtures, Armco Steel Corporation, Middletown, Ohio.	GPO $2.50
12010 DIM 08/70	Pyrite Depression by Reduction of Solution Oxidation Potential, University of Utah, Salt Lake City, Utah.	GPO $0.70 NTIS/PB-200-257
12010 DUL 02/71	Limestone Treatment of Rinse Waters from Hydrochloric Acid Pickling of Steel, Armco Steel Corporation, Middletown, Ohio.	GPO $1.50
12010 EQF 03/71	An Electromembrane Process for Regenerating Acid from Spent Pickle Liquor, Southern Research Institute, Birmingham, Alabama.	GPO $1.00
12010 DRH 11/71	Ultrathin Membranes for Treating Metal Finishing Effluents by Reverse Osmosis· by North Star Research & Development Institute (through Minnesota Pollution Control Agency), Minneapolis, Minn.	GPO $1.00
12010 DTQ 02/72	Combined Steel Mill and Municipal Wastewaters Treatment, Weirton Steel Div., National Steel Corporation, Weirton, West Virginia.	GPO $1.50
12010 DPF 11/71	Brass Wire Mill Process Changes and Waste Abatement, Recovery and Reuse, Volco Brass and Copper Company, Kenilworth, New Jersey.	GPO $0.55
EPA-R2-73-044	Chemical Treatment of Plating Waste for Removal of Heavy Metals, Beaton & Corbin Manufacturing Co., Southington, Conn.	GPO $0.75

Report Number	Title/Author	Source
12010 EDY 12/73	Biological Removal of Carbon and Nitrogen Compounds from Coke Plant Wastes, American Iron and Steel Institute, New York, New York	GPO $2.00
12010 DFS 12/73	Investigation of Treating Electroplaters Cyanide Waste by Electrolysis, RAI Research Corporation, Long Island City, New York.	GPO $0.90
12070 HEK 12/73	Regeneration of Chromated Aluminum Deoxidizers, Beoing Co., Seattle, Washington.	GPO $1.95
12010 DSA 7/74	Waste Water Treatment and Reuse in a Metal Finishing Job Shop, S. K. Williams Company,	GPO $0.90
EPA-660/2-73-033	New Membranes for Reverse Osmosis Treatment Of Metal Finishing Effluents', Minnesota Pollution Control Agency, Minneapolis, Minn.	GPO $1.40
EPA-R2-73-247a	Water Pollution Control in the Primary Nonferrous Metals Industry - Vol. I Copper, Linc, and Lead Industries, Battelle Memorial Institute , Columbus, Ohio.	GPO $1.90
EPA-R2-73-247b	Water Pollution Control in the Primary Nonferrous Metals Industry - Vol II, Aluminum, Mercury, Gold, Silver, Molybdenum, and Tungsten, Battelle Memorial Institute, Columbus, Ohio.	GPO $1.45
EPA-670/2-74-008	Metallic Recovery from Wastewaters Utilizing Cementation, Anaconda American Brass, Waterbury, Connecticut.	GPO

MISCELLANEOUS INDUSTRIAL POINT SOURCES

The Miscellaneous Program Area is defined as that technology research oriented to providing the below listed industries with economically viable technology to meet the effluent standards for point source discharge.

Photographic Processing

Flat Glass

Glass and Glassware Pressed or Blown

Purchased Glass Fabrication

Hydraulic Cement

Structural Clay Products

Pottery Products

Concrete, Gypsum, and Plaster

Cut Stone and Stone Products

Abrasive, Asbestos, and Miscellaneous Nonmetallic Mineral Products

Instrument Manufacturing

Miscellaneous Manufacturing Industries

Water Supply

Commercial Laundries

Tank Truck, Terminals

Drum Barrel Cleaning

PROJECT INDEX

MISCELLANEOUS INDUSTRIAL POINT SOURCES

	Grantee or Contractor	Project Status
DOD	Rensselaer Polytechnic Institute	A
ERC	American Water Works Association Research Foundation	A
ERF	Berkey Film Processing	B
ESW	Gainesville, Florida	A
EUR	American Water Works Association Research Foundation	A
EZF	Johns - Manville Products Corporation	A
FRM	Albany, New York	B
FYV	IIL/LSAA Technical Liaison Committee	A
GCH	Vermont Department of Water Resources	A
GLE	Culligan International Company	B
HBM	Oregon Concrete and Aggregate Producers Assoc.	B
800936	American Water Works Association	A
801872	Southern Research Institute	B
802044	Franklin Institute	B
802196	Portland Cement Association	B
802800	Montgomery, Alabama	B
803142	Franklin Institute	B
803196	Johnson County, Water District #1, Kansas	B
803239	Stanford Research Institute	B

Project Status:
A - Completed, Final Report Available
B - Project Ongoing
C - Project Discontinued

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DOD

TITLE OF PROJECT: Removal of Syndets and Reclamation of Laundry Wastes

GRANTEE OR CONTRACTOR:
Rensselaer Polytechnic Institute
Research Division
Troy, New York 12181

EPA PROJECT OFFICER:
Mr. Richard Keppler
Region I, EPA, John F.
Kennedy Federal Building
Boston, Massachusetts 02203

Project Site: Troy, New York

DESCRIPTION OF PROJECT

Award Date: December 1, 1968

Project Cost: $53,090

Completion Date: November 1, 1971

Federal Cost: $25,055

Summary: The objective of this project is to optimize and evaluate the best process or combination of processes attainable for the treatment and recovery of laundromat wastewaters. Two commercially available treatment systems for laundromat wastewaters are to be used in the optimization and evaluation project. - Laboratory and field studies were conducted to evaluate the capabilities of two commercially available laundromat waste treatment systems to treat laundromat wastes with the possibility of recycling the treated effluent. The Winfair Water Reclamation System (WWRS) involves the addition of alum to a pH of 4, sedimentation, sand filtration, carbon adsorption, and passage through ion exchange resins. The American Laundry Machinery Industries system employs chemical precipitation prior to filtration through Diatomaceous Earth. - The WWRS achieved a 56% BOD reduction, 62% COD reduction, and 94% ABS reduction, but suffered from a buildup of total solids in the effluent. The system produced an effluent suitable for discharge into many streams. For effluent recycling, a functioning demineralizer would be required. - The ALMI system achieved a 63% BOD reduction, 69% COD reduction, 87% ABS reduction, 94% PO_4 reduction, and complete coliform removal. The increase in effluent alkalinity and hardness render very questionable the suitability of the effluent for reuse without softening and pH adjustment. The use of the system would cost about 10¢ per wash.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: ERC

TITLE OF PROJECT: Disposal of Wastes from Water Treatment Plants

GRANTEE OR CONTRACTOR:

American Water Works Association
Research Foundation
2 Park Avenue
New York, New York 10016

EPA PROJECT OFFICER:

Mr. George Webster
EPA, Water Quality Research
Washington, D. C. 20460

Project Site: New York, New York

DESCRIPTION OF PROJECT

Award Date: July 25, 1968

Completion Date: July 25, 1969

Project Cost: $53,250

Federal Cost: $46,305

Summary:

The final report to this project presents an intensive study of the disposal of wastes from water treatment plants. The wastes include filter washwater; sludge resulting from coagulation, softening, iron and manganese removal processes; diatomaceous earth filtration; and ion exchange brines. - A series of four status reports describe in detail what is known of the research, engineering, plant operation, and regulatory aspects of the problem. A special report reviews current technology and analyzes costs of disposal methods, based on data collected from 15 operating plants. - Final reports were prepared by committees of conference participants to identify future needs for information in each aspect of the waste disposal problem. These reports recommend substantially expanded programs of research and demonstration. They include extensive lists of specific problems which must be investigated to develop effective and economical technology. Committee reports also recommend establishment of a central service to promote the planning of research and development, and to implement effective programs of new or improved technology. The service would collect, coordinate, and disseminate data on all aspects of water treatment plant waste disposal problems.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL. 92-500)

PROJECT NUMBER: ERF

TITLE OF PROJECT: Treatment of Complex Cyanide Compounds for Reuse and Disposal

GRANTEE OR CONTRACTOR:

Berkey Film Processing
260 Lunenburg Street
Fitchburg, Massachusetts 01420

EPA PROJECT OFFICER:

Mr. Thomas Devine
New England Basins Office, EPA
240 Highland Avenue
Needlam Heights, Massachusetts
02194

Project Site: Rochester, New York

DESCRIPTION OF PROJECT

Award Date: April 23, 1970

Project Cost: $163,576

Completion Date: April 23, 1971

Federal Cost: $114,415

Summary:

The basic objective in this project is to research and develop methods for the treatment of ferrocyanide waters from film processing for recovery and disposal. Recovery methods to be explored are ozonation and electrolytic oxidation to ferricyanide. Treatment for disposal includes ozonation for destruction, precipitation of complex cyanides, and chlorination.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: ESW

TITLE OF PROJECT: Magnesium Carbonate, a Recycled Coagulant for Water Treatment

GRANTEE OR CONTRACTOR:

City of Gainesville, Florida

EPA PROJECT OFFICER:

Mr. Edmond Lomasney
Region IV, EPA
1421 Peachtree Street, N.E.
Atlanta, Georgia 30309

Project Site: Gainesville, Florida

DESCRIPTION OF PROJECT

Award Date: November 12, 1969

Project Cost: $27,554

Completion Date: June 11, 1971

Federal Cost: $16,890

Summary:

The principal investigator has a modified process for the recovery of MgO from brucite or dolomite to the separation and essentially quantitative recovery of the Mg $(OH)_2$ present in lime-soda softening sludges as very pure (99.7 percent) $MgCO_3$. This new process has been successfully tested on a pilot-plant scale at Dayton, Ohio. Another improvement of the process makes it possible for each of the several cities and industrial plants softening hard surface waters containing clay turbidity to employ both lime recalcination and magnesium recovery. This will substantially reduce treatment costs and also substantially eliminate a major water pollution problem. Applications of $MgCO_3$ as a coagulant to be studied include the following: 1. Use in the removal of turbidity and organic color from soft surface waters; 2. Use in the removal of turbidity and organic color from hard or alkaline surface or well waters; 3. Use in flocculation or sewage and for many types of industrial wastes; 4. Use with synthetic organic anionic and cationic polymers in the three applications listed above.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EUR

TITLE OF PROJECT: Information Resource for Water Pollution Control in the Water Utility Industry

GRANTEE OR CONTRACTOR:

American Water Works Association
Research Foundation
2 Park Avenue
New York, New York 10016

Project Site: New York, New York

EPA PROJECT OFFICER:

Mr. George Webster
Industrial Pollution Control
Division (PD-679)
Environmental Protection Agency
Washington, D. C. 20460

DESCRIPTION OF PROJECT

Award Date: June 28, 1970

Completion Date: December 31, 1971

Project Cost: $42,720

Federal Cost: $24,990

Summary:

The objective of this project is to establish a research and development oriented information resource for the water utility industry. The information center will provide efficient collection, synthesis, and dissemination of information pertaining to the development and demonstration of water pollution control technology within the water utility industry.

The available literature concerning the water pollution control technology of the water industry will be abstracted and indexed for the Water Resources Scientific Information Center.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EZF

TITLE OF PROJECT: Phenolic Wastewater Reuse by Diatomite Filtration

GRANTEE OR CONTRACTOR:

Johns-Manville Products Corp.
Manville, New Jersey

EPA PROJECT OFFICER:

Mr. Charles H. Ris
Industrial Pollution Control
Division (RD-679), ORD
Environmental Protection Agency
Washington, D. C. 20460

Project Site: Defiance, Ohio

DESCRIPTION OF PROJECT

Award Date: September 1, 1967

Completion Date: September 1, 1970

Project Cost: $164,700

Federal Cost: $ 82,350

Summary:

The fiberglass industry has long had a problem in disposing of wastewater containing phenolic resins. In the fiberglass manufacturing process, airborne glass fibers are sprayed with a phenolic resin as the fiber blanket is formed on the collecting conveyor, causing a deposit of resin to form on the conveyor chain. Prompt cleaning before the deposit sets is needed to permit continuous formation of the glass fiber mat. The wastewater originates from the chain washing operation which uses either a caustic wash or high volume showers to remove the resin deposits. Under the demo project a chain cleaning - water reuse system was installed which consists of low-volume, high-pressure chain cleaning units with water consumption of eight gallons per minute at 1000 psi, two stages of primary filtration to remove large particles and fiber, and a secondary diatomite filter to remove fine particulate matter. The filtered water is suitable for reuse in the binder batch, overspray system, and the chain cleaning units. The water reuse system has reduced the quantity of water required for chain cleaning, will use water 4.5 times before evaporation removes it from the system, requires 1 lb of diatomite per 500 gallons of resin-bearing water filtered, and provides water at a net cost of $.37/1000 gallons-vs- $.75/1000 gallons for city water.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: FRM

TITLE OF PROJECT: Treatment of Waste Alum Sludge

GRANTEE OR CONTRACTOR:

City of Albany, New York
Dept. of Water and Water Supply
City Hall, Albany, New York 12207

EPA PROJECT OFFICER:

Dr. J. B. Farrell
National Environmental
Research Center, EPA
Cincinnati, Ohio 45268

Project Site: Feura Bush, New York

DESCRIPTION OF PROJECT

Award Date: June 27, 1971

Completion Date: August, 1972

Project Cost: $45,430
(Phase I Only)

Federal Cost: $31,871

Summary:

The purpose is to conduct a detailed pilot-plant alum sludge filtration study at the Feura Bush Water Treatment Plant of the City of Albany.

The objectives being to optimize operating parameters, demonstrate process reproducibility, and develop information necessary for full-scale plant design.

Rotary vacuum precoat filtration of alum sludge will be conducted, and technical and economic feasibility will be determined.

A comparison of the performance of various filter aid grades and other operating variables and cost effectiveness of the sludge treatment will be made. Design criteria for a full-scale facility will be sought.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: FYV

TITLE OF PROJECT: Modular Laundry Wastewater Treatment System for the Textile Maintenance Industry

GRANTEE OR CONTRACTOR:

IIL/LSAA Technical Liaison Committee
P. O. Box 2427
Miami Beach, Florida 33140

EPA PROJECT OFFICER:

Mr. Arthur H. Mallon, P.E.
Industrial Pollution Control
Division (RD-679), ORD
Environmental Protection Agency
Washington, D. C. 20460

Project Site: The Roscoe Co., 3517 W. Harrison, Chicago, Ill. 60624

DESCRIPTION OF PROJECT

Award Date: February 1, 1971

Project Cost: $185,277

Completion Date: August 1, 1972

Federal Cost: $122,613

Summary:

A wastewater treatment system consisting of chemical treatment and flocculation facilities, dissolved-air flotation for solids-liquids separation, diatomaceous earth filtration for polishing the flotation effluent, and vacuum filtration dewatering of flotation scum was installed at a commercial laundry. Data was obtained on effluent quality, sludge volume, chemical costs and other operating costs for industrial laundry wastewater, linen laundry wastewater, and uniform laundry wastewater. The final effluent of the linen and uniform laundry wastewater treatment met municipal sewer ordinance requirements for grease and heavy metals. Wastewater suspended solids and BOD were also significantly reduced, so that high municipal sewer surcharges would not be imposed. The effluent from the industrial laundry wastewater treatment did not consistently meet municipal sewer ordinance standards. Complete wastewater treatment operating costs were on the order of $0.80/cu m ($3.00/1000 gal.) for industrial laundry wastewater, $0.66/cu m ($2.50/1000 gal.) for uniform laundry wastewater and $0.40/cu m ($1.52/1000 gal.) for linen laundry wastewater. It was concluded that the treatment system had applicability in treating laundry wastewater.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: GGH

TITLE OF PROJECT: Granite Industry Wastewater Treatment

GRANTEE OR CONTRACTOR:

Vermont Department of Water Resources
Montpelier, Vermont 05602

EPA PROJECT OFFICER:

Mr. Allyn Richardson
Region I, EPA
John F. Kennedy Federal Bldg.
Boston, Massachusetts 02203

Project Site: Univ. of Vermont, Burlington, Vermont 05401

DESCRIPTION OF PROJECT

Award Date: September 1, 1970

Project Cost: $87,868

Completion Date: November 30, 1971

Federal Cost: $61,508

Summary:

The purpose is to develop and demonstrate a system capable of abating the water pollution generated in granite processing. Included are studies to optimize industry operations, determine process water demands, and verify wastewater characteristics. The project included a study of overall water use in a granite plant, water optimization studies, and water reduction studies. Laboratory testing was conducted for waste characterization and liquid solids separation techniques. A pilot plant was designed, constructed and operated to test the efficiency of plant scale separation procedures. A prototype plant was designed and constructed to test the possibility of complete water reuse in the granite industry. Successful operation of both plants indicates that a practical method of treating granite waste effluent has been developed and that complete recycle of treated effluent is possible and economically feasible. Studies were performed to determine the possibility of by-product use of waste granite sludge. Two uses were found for the sludge, but an economic evaluation indicated that there was insufficient raw material to establish a by-product industry. A survey of sludge disposal methods in the industry showed that some modification of waste disposal facilities, and more cooperation by the industry, would improve the sludge disposal procedures. A modified type of settling lagoon was recommended.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: GLE

TITLE OF PROJECT: Industrial Water Softener Waste Brine Reclamation

GRANTEE OR CONTRACTOR:

Culligan International Co.
One Culligan Parkway
Northbrook, Illinois 60062

EPA PROJECT OFFICER:

Mr. Vern Tenney
Region IX, EPA
760 Market Street
San Francisco, California 94102

Project Site: Riverside, California

DESCRIPTION OF PROJECT

Award Date: April 15, 1971

Completion Date: February 1974

Project Cost: $121,212

Federal Cost: $69,797

Summary:

There are two alternatives for discharge of water softener regenerant brines to receiving streams: 1. Truck to approved dumping site; 2. Reclaim for reuse. Brine reuse has been studied at a central regeneration facility for portable water softeners. Reclamation used modified lime-soda softening for the waste brine to produce an acceptable regenerant brine. Regenerant wastes were reduced by 89% to produce an environmentally acceptable sludge. The process is feasible technically, marginal economically. The added costs for lime and soda ash are less than is the value of salt and water reclaimed by their use. That is, the process is cheaper chemically; however, equipment and labor costs negate this savings. Depreciation and operating costs were high at the test location; total costs favor trucking wastes to an approved dumping site.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: HBM

TITLE OF PROJECT: State-of-the-Art of Ready Mix, Concrete and Aggregate Production

GRANTEE OR CONTRACTOR:

Oregon Concrete and Aggregate
Producers Association
11800 S. W. Fairfield
Beaverton, Oregon

EPA PROJECT OFFICER:

Mr. Edward G. Shdo
Region X, EPA
1200 Sixth Avenue
Seattle, Washington 98101

Project Site: Beaverton, Oregon

DESCRIPTION OF PROJECT

Award Date: June 30, 1971

Completion Date: March 1, 1972

Project Cost: $27,400

Federal Cost: $23,600

Summary:

The study involved the gathering of data to determine the kind and extent of present treatment methods for process water used in aggregate production. It investigated the impact of the associated pollution problem and detail existing treatment techniques. Information on pollution loads, plant sizes, removal efficiencies, and construction and operating costs was reported. Gaps in technology are identified and recommendations for research and priorities were made directed towards abatement of water pollution and recycling of the process waters. The project report contains discussions of various water clarification systems used in the aggregate and ready-mixed concrete industries. The overall problem of wastewater disposition in each type of plant is studied. An analysis is made of the use of settling ponds, filter ponds and coagulants. Recycling and use of recycled water is discussed with recommendations for further study of the potential use of wastewater from ready-mix plants for concrete batch water. Since many aggregate and ready-mix concrete plants now have effective clarification or recycling systems the overall purpose of the study is to make these systems known throughout the industry so proven systems can be made available to all. The report is based on a review of systems in reported 77 plants and firms plus data obtained from a field trip inspection of 88 plants on the West coast.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 800936

TITLE OF PROJECT: Information Resource for Water Pollution Control in the Water Utility Industry

GRANTEE OR CONTRACTOR:

American Water Works Association
Research Foundation
2 Park Avenue
New York, New York 10016

EPA PROJECT OFFICER:

Mr. George Webster
Industrial Pollution Control
Division (RD-679), ORD, EPA
Washington, D. C. 20460

Project Site: New York, New York

DESCRIPTION OF PROJECT

Award Date: February 1, 1972

Completion Date: January 31, 1973

Project Cost: $46,953

Federal Cost: $26,147

Summary:

The objective of this project is to establish a research and development oriented information resource for the water utility industry. The information center will provide efficient collection, synthesis, and dissemination of information pertaining to the development and demonstration of water pollution control technology within the water utility industry.

The available literature concerning the water pollution control technology of the water industry will be abstracted and indexed for the Water Resources Scientific Information Center.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 801872

TITLE OF PROJECT: Study of the State-of-the-Art of Disposal and Utilization of Waste Kiln Dust from the Cement Industry

GRANTEE OR CONTRACTOR:

Southern Research Institute
2000 Ninth Avenue South
Birmingham, Alabama 35205

EPA PROJECT OFFICER:

Mr. Edmond Lomasney
EPA, Region IV
1421 Peachtree Street
Atlanta, Georgia 30309

Project Site: Birmingham, Alabama

DESCRIPTION OF PROJECT

Award Date: July 6, 1972

Project Cost: $28,496

Completion Date: January 1975

Federal Cost: $25,000

Summary:

The rotary kilns used in the manufacture of Portland Cement emit large amounts of dust. To prevent air pollution, this dust is collected in cyclones, bag filters, and electrostatic precipitators. The dust from many cement plants is high in alkali content, and much of it cannot be returned to the cement making process. Therefore, it presents a solid waste disposal problem. The solid waste disposal problem can be solved by leaching the alkalies out of dust and returning the dust to the kiln, but leaching poses water pollution problems unless the alkalies can be removed from the water. The proposed state-of-the-art study will determine the extent of the problem of dust disposal, the present practices used by various cement manufacturers for solving the problem, and prospects for solving the problem on an industry-wide basis. We plan to contact all cement manufacturers in the United States and to visit plants that have well-defined approaches or solutions to the dust disposal problem. The results of the study will be presented in the form of a report that will include estimates of the amount of dust discarded, descriptions of present utilization processes, a bibliography of pertinent literature, and discussion of processes that are of potential value in dust utilization.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 802044

TITLE OF PROJECT: Development of a Monthly Industrial Technology Bulletin

GRANTEE OR CONTRACTOR:

The Franklin Institute Research
Laboratories
20th Street and the Parkway
Philadelphia, Pennsylvania 19103

Project Site: Philadelphia, Pennsylvania

EPA PROJECT OFFICER:

Mr. Charles H. Ris
Industrial Pollution Control
Division (RD-679), ORD, EPA
Washington, D. C. 20460

DESCRIPTION OF PROJECT

Award Date: August 1, 1974

Completion Date: July 1973

Project Cost: $26,462

Federal Cost: $23,815

Summary:

A current-awareness bulletin emphasizing advancements in the field of industrial technology as related to water quality and water pollution control will be provided to key technical and administrative personnel, both government and non-government, as directed by the EPA Project Officer. A monthly publication containing approximately 30 abstracts of articles pertinent to industrial pollution control technology will be prepared for and distributed to the aforementioned recipients. Annual subject and author indexes as well as a list of all journals from which articles were summarized in the bulletin will also be provided under this grant.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 802196

TITLE OF PROJECT: Elimination of Water Pollution by Recycling Cement Plant Dusts

GRANTEE OR CONTRACTOR:

Portland Cement Association
Old Orchard Road
Skokie, Illinois 60076

EPA PROJECT OFFICER:

Mr. Donald Wilson
EPA - IWTRL
Edison, New Jersey

Project Site: Skokie, Illinois

DESCRIPTION OF PROJECT

Award Date: March 1, 1973

Project Cost: $450,000

Completion Date: August, 1976

Federal Cost: $ 49,242

Summary:

Overall objectives: Elimination of problems associated with disposal of kiln dust from cement plants. Specifically by (a) Formation of clinker with concomitant volatilization of alkalies, (b) Leaching of water-soluble alkalies and return of leachate to system, (c) Other uses of dust, fertilizer, soil stabilizer, or agricultural limestone and, (d) Use of dust as admixture to modify cement or cement products.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 802800

TITLE OF PROJECT: $MgCO_3$ Coagulation in Treatment of Potable Water

GRANTEE OR CONTRACTOR:

Water Works and Sanitary Sewer Board
City of Montgomery
P. O. Box 1631
Montgomery, Alabama 36102

EPA PROJECT OFFICER:

Mr. Edmond Lomasney
Region IV, EPA
1421 Peachtree Street, N.E.
Atlanta, Georgia 30309

Project Site: Montgomery, Alabama

DESCRIPTION OF PROJECT

Award Date: June 1, 1971

Project Cost: $214,520

Completion Date: May 31, 1973

Federal Cost: $99,500

Summary:

The City of Montgomery under the direction of the consultant will operate a pilot-scale facility to demonstrate the use of $MgCO_3$ as a coagulant for the treatment of municipal water. The pilot system (50 gpm) will be operated to verify the scale-up and operating parameters for a subsequent 10-mgd demonstration and evaluation of the $MgCO_3$ system.

The concept of using $MgCO_3$ as a coagulant stems from the search for a solution to the ever increasing problem of disposing of the alum sludges from municipal water treatment. The concept to be piloted and demonstrated will use $MgCO_3$ as the flocculant with MgOH precipitated with the addition of lime. A scheme for recycling the magnesium by carbonation with CO_2 will produce a sludge which is easily dewatered and at the same time recover at least 90 percent of the magnesium for reuse. The project activities will make operational, technical, and cost comparisons between the $MgCO_3$ and conventional alum coagulation systems.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 803142

TITLE OF PROJECT: Preparation of the Industrial Technology Bulletin

GRANTEE OR CONTRACTOR:

The Franklin Institute Research
Laboratories
20th and Race Streets
Philadelphia, Pennsylvania 19103

EPA PROJECT OFFICER:

Mr. Charles H. Ris
Industrial Pollution Control
Division (RD-679), ORD, EPA
Washington, D. C. 20460

Project Site: Philadelphia, Pennsylvania

DESCRIPTION OF PROJECT

Award Date: June 15, 1974

Project Cost: $31,563

Completion Date: July 1975

Federal Cost: $28,403

Summary:

The Franklin Institute Research Laboratories, Science Information Services Department, will provide key technical and administrative personnel, both government and non-government, with a current-awareness bulletin of abstracts emphasizing advancements in the field of industrial technology as related to water quality and water pollution control. This will be in the form of a monthly publication containing approximately 30 abstracts of articles pertinent to industrial technology which will be distributed to the aforementioned recipients. Annual subject and author indexes, a journal list, and a compilation of each of the monthly bulletins will be included in the final report, along with camera-ready copy of the entire final report.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 803196

TITLE OF PROJECT: Recovery, Recycle, and Reuse of CO_2, Lime, and Magnesium in Potable Water Treatment

GRANTEE OR CONTRACTOR:

Water District #1 of Johnson County
5030 Beverly Street
Mission, Kansas

EPA PROJECT OFFICER:

Mr. Alden Christianson
EPA, PNERL
Corvallis, Oregon

Project Site: Mission, Kansas

DESCRIPTION OF PROJECT

Award Date: July 15, 1974

Completion Date: January, 1976

Project Cost: $267,785

Federal Cost: $130,000

Summary:

The objectives are: 1) Determine the technical and economic feasibility of calcium carbonate beneficiation by froth flotation; 2) Determine the technical and economic feasibility of producing magnesium compounds from highly turbid surface waters; 3) Develop design information for all unit operations and processes involved; 4) Provide overall economic analysis and process evaluation in comparison with the existing process and alternate methods of sludge treatment. A two MGD pilot scale study of the various operations will be conducted over a one year period. Various water qualities will be obtained by mixing desired quantities of well and surface waters.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 803239

TITLE OF PROJECT: Review of Industrial Technologies-Research and Development Needs for Meeting the Requirements of PL 92-500

GRANTEE OR CONTRACTOR:

Stanford Research Institute
333 Ravenswood Avenue
Menlo Park, California 94025

EPA PROJECT OFFICER:

Mr. Marshall Dick
Industrial Pollution Control
Division (RD-679), ORD, EPA
Washington, D. C. 20460

Project Site: Menlo Park, California

DESCRIPTION OF PROJECT

Award Date: June, 1974

Project Cost: $75,275

Completion Date: June, 1975

Federal Cost: $71,500

Summary:

The objective of the study is to provide the Industrial Pollution Control Division with an assessment of the adequacy of the current industrial water pollution control research program for those industrial point sources specified in PL 92-500. SRI will assess the rationale and the methodology set forth by the Industrial Pollution Control Division for the program goals or milestones listed. The evaluation of an on-going process development and demonstration program requires a logical approach to problem identification or situation analysis. This will be followed by detailed problem definition and specification. Finally, a decision analysis study will be conducted to select the most desirable program for satisfying the research goals.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

FINAL REPORTS AVAILABLE

MISCELLANEOUS INDUSTRIAL SOURCES

Report Number	Title/Author	Source
12120 ERC 08/69	Disposal of Wastes from Water Treatment Plants, American Water Works Association Research Foundation, New York, New York	NTIS/PB 186 157
12120 ESW 06/71	Magnesium Carbonate, A Recycled Coagulant for Water Treatment, by Dept. of Public Utilities, City of Gainesville, Florida	GPO - $1.00
12120 EUR 11/71	Information Resource: Water Pollution Control in the Water Utility Industry, by American Water Works Assoc. Research Foundation, New York, New York	GPO - $1.50
12080 EZF 09/70	Phenolic Water Reuse by Diatomite Filtration, Johns-Manville Products Corporation, Manville, New Jersey	GPO - $1.25

RUBBER PRODUCTS INDUSTRY
SYNTHETIC RUBBER AND TIRE SEGMENT

The program area is defined as the TR oriented to providing those establishments engaged in manufacturing - rubber by polymerization and manufacturing pneumatic casings, inner tubes, solid and cushion tires - with economically viable technology needed to meet effluent standards for point source discharge.

The program area is initially divided into two categories - Synthetic Rubber (SIC 2822) and Tire and Inner Tube (SIC 3011), although all manufactured products in 2822 are not covered. Water use figures for 1968 (in billion gallons) reveal the following trends for SIC 2822 and 3011 respectively: water intake - 236.2, 233.2 of which 57.2, 32.2 is process; 0.4, 55.6 is for power generation, 155.2, 116.6 is for cooling and condensing: 23.5, 28.4 is for boiler and sanitary use; water use - 1279.7, 542.8 and water discharged - 219.2, 225.2.

SYNTHETIC RUBBER

Although Styrene-butadiene rubbers dominate the production of synthetic rubber there are 10 other significant production types. These are produced in 23 plants across the U. S., 12 of which have 1972 production greater than 60,960 metric tons/year.

Principal Synthetic Rubber	1972 U.S. Production (1,000 kkg/year)	Polymerization Process
Styrene-Butadiene (SBR)	1,678	Emulsion
	139	Solution
Polybutadiene (PBR)	368	Solution
Polyisoprene	139	Solution
Polyisobutylene-Isoprene (butyl)	163	Solution
Ethylene-Propylene Co-polymer (EPR)	169	Solution
Acrylonitrile-Butadiene (Nitrile)	159	Emulsion
Polychloroprene (Neoprene)	177	Emulsion
Butadiene	64	Emulsion
Epichlorohydrin	9	Solution
Acrylic	2	Emulsion
Polyisobutylene	4	Solution
Silicone[1]	(10)	Condensation
Polyurethane[1]	(14)	Condensation
Fluorocarbon derivative[1]	(1)	Emulsion
Chlorosulfonated Polyethylenes[1]	(15)	Backbone Mod.
Polysulfide[2]	10	Condensation
Synthetic Rubber Total	3,081 (40)	

[1] Are considered part of Plastics and Synthetics Industry by EPA.
[2] Polysulfide rubber production is not covered by this document.

With the exception of 4 types, synthetic rubbers are manufactured by polymerization of unsaturated monomers, in solvent or emulsion systems. Various additives give desired properties and resistance to degradation. While the bulk of these products are produced in solid or crumb form, a portion is also produced in the intermediate latex form. The two types of polymerization and the intermediate product constitutes the technological basis for sub-categorizing the industry.

The wastes generated by the synthetic rubber industry are those of a chemical processing plant: biodegradable and refractory organics (monomers, solvents, emulsifiers, additives) plus suspended solids (largely rubber particles and carbon black) and dissolved ions (catalysts, coagulants, acids and salts). Some heavy metal ions may also be present, if boiler or cooling system blowdown has not been segregated. All three subcategories generate contact wastewaters which contain the same general constituents. The significant water quality parameters are COD, BOD, suspended solids, dissolved solids, and oil and grease.

TIRE AND INNER TUBE

In 1971 approximately 181 million tires were manufactured in the U.S., while 55.1 million inner tubes were manufactured and 276,250 kkg of retreading rubber was handled. This was accomplished in 56 plants of which 19 have capacities greater than 20,000 units/day. Although the nature of the product has changed markedly over the recent years, the basic manufacturing process has remained quite similar.

The typical tire manufacturing process consists of the following:

1. Preparation or compounding of the raw materials.
2. Transformation of these compounded materials into five tire components - tire bead coating, tire threads, tire side wall, inner liner stock and coated cord fabric.
3. The building, milding, and curing of the final product.

A wide variety of synthetic rubbers are used and of the compounding materials used, the fillers, extenders and reinforcers are the most important with, carbon black and oil the most common. A typical rubber compound might be described as follows: 100 parts rubber; 50 parts fillers, extenders, and reinforcers; 3.5 parts curing and accelerator agents; 8.0 parts antioxidants and pigments.

The tire and tube industry essentially has no contact or process waste water but, in fact, there is contaminated discharge due to normal plant spills and leaks of oil and grease from blending and rolling mills, suspended solids from grinding operations (rubber fines) and from the compounding area (soapstone).

For research purposes the industry is categorized into 2 segments: old tire plants (pre 1959) and new plants (post 1959). The technological factors involved in this subcategorization center upon wastewater loads and the economics of retrofitting control systems. The older plants do not have the benefit of modern (post 1959) design criteria in both the waste management and plant maintenance fields.

While the wastes generated by the tire industry would appear to be amenable to containment and use of closed loop systems, it appears that the industry has not progressed to this level of implementation. There are instances where different segments of the wastewater have been isolated and either the oil or the soapstone recovered and reused or disposed of as a concentrate.

PLASTIC AND SYNTHETIC MATERIALS MANUFACTURING
SYNTHETIC RESINS SEGMENT

Plastics and synthetics manufacturing are highly dynamic and competitive industries serving most, if not all, segments of the world-wide economy, with emphasis on the buildings, packaging and automotive industries. As society's requirements change, the industry has, of necessity, also changed its products to meet these needs. It has been able to do this thanks to its very strong technological orientation. The industry is composed of some 400 plants, most of which are relatively new (10-15 years) by industrial standards and produce products which were not in commercial use 25 years, or less, ago. This industry produces over 24 billion pounds of product worth approximately $5 billion annually. The industry is, to a high degree, married to the petrochemical industry for its raw materials. For 1972 the 10 major types of products were:

1972 Consumption Figures, M Metric Tons	
Polyethylene (LD, HD)	3398
Polyvinyl Choride (& copm)	1975
Polystyrene	1196
Polyester (fiber & resin)	1070
Nylon (fiber & resin)	1006
Polypropylene	767
Phenolics	652
Acrylics (& SAN, ABS)	639
Rayon & Cellophane	575
Urea & Melamines	411

Very definite trends exist in the industry for a number of the products; for example, PVC is growing rapidly while cellulosics are continuing to lose ground to newer synthetics such as polyester. Over the last decade (1962-1972), the overall annual growth rate for the industry was 13%, while some individual materials, e.g., polyvinyl chloride, are now increasing at 20% annually. Phenolics, after a decline of several years, may now be experiencing a rejuvenation.

The industry's products are derived from two basic polymerization procedures: condensation (or step growth) and addition (or chain growth). Another group of products, the cellulosics are derived from a natural product, wood pulp and converted to the desired form by chemical reaction and dissolution without grossly altering the original polymer structure. Manufacture by the industry uses both continuous and batch operations depending on the nature of the product and the volume. Polymerization may be carried out in bulk form (vapor or liquid), solution, emulsion or suspension. Plants vary from the very large producing more than 500 million pounds annually to small producing small batches of "customized" products for specific end-users.

Barring a few unusual and low volume inorganic materials, the industry may be classified as organic chemical manufacturing. In addition to wastes common to almost all industry such as cooling, broiler and sanitary waters which generally are not segregated, this industry can broadly be expected to generate organic wastes such as solvents, unreacted monomers, oligomers, emulsifiers, and waste polymers, oils and greases, metallic catalysts, acids, bases and salts. The result of these waste sources is that the industry's raw waste can be expected to contain significant levels of COD, suspended solids and possibly dissolved solids and metallic ions. The portion of the COD which may be biodegradable will depend on the product and manufacturing process, the presence of toxic constituents and their concentrations. Although, in some cases, alternate manufacturing processes which are less polluting have been devised; in other cases, the inherent character of the system, e.g., phenols from phenolic resins, nitrogenous wastes from ureas and melamines, and acrylonitrile from acrylics manufacture, may not be so readily avoidable.

Many of the larger plants are part of industrial complexes and contribute to a single treatment facility; others, particularly smaller plants, discharge to municipal treatment systems. In every case, however, treatment has been oriented to removal of suspended solids and BOD by sedimentation, chemical coagulation and biological treatment, usually by aerated lagoons or activated sludge systems. Where such industrial systems are in use, exceedingly long detention times are often necessary to oxidize the bio-refractories usually present. Because of the toxicity of some of the industry's wastes, careful equalization is usually necessary if upsets of the biological system are to be prevented. Lagoons for further sedimentation and biodegradation may be found as polishing units where land availability permits.

The solid wastes generated by the industry usually would consist of biological sludge, process tars and waste polymers. Current practice is to dispose of this material as landfill, even though the degradation resistance of many of the polymers and the possible accumulation of catalyst metals suggest that this route may be less than desirable.

PROJECT INDEX

RUBBER AND PLASTICS PRODUCTS

	Grantee or Contractor	Project Status
DJI	B. F. Goodrich Chemical Company	A
EUX	Fiber Industries, Inc.	A
ESG	American Enka, Corporation	A
GLP	Firestone Tire and Rubber Company	A
GUT	General Tire and Rubber Company	B
PCO	Beaunit	B
801173	Owens - Corning Fiberglas, Corp.	B
801200	University of Massachusetts	B

Project Status:
A - Completed, Final Report Available
B - Project Ongoing
C - Project Discontinued

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DJI

TITLE OF PROJECT: Waste Treatment Facilities for Polyvinyl Chloride Manufacturing Plant

GRANTEE OR CONTRACTOR:
B. F. Goodrich Chemical Company
3135 Euclid Avenue
Cleveland, Ohio 44115

EPA PROJECT OFFICER:
Gilbert Horowitz
Region III, EPA
Curtis Building
Sixth and Walnut Streets
Philadelphia, Pennsylvania 19106

Project Site: Salem County, New Jersey

DESCRIPTION OF PROJECT

Award Date: July 2, 1968

Project Cost: $823,100

Completion Date:

Federal Cost: $364,900

Summary: B. F. Goodrich Chemical Company has completed construction and has begun operation of a new polyvinyl chloride (PVC) production plant that includes emulsion, suspension, & bulk polymerization processes.

This project involved the development, demonstration, and evaluation of the bio-chemical treatment of wastewaters from a typical polyvinyl chloride manufacturing plant at a 0.85-mgd scale of operation.

The treatment system is to produce effluent to meet the receiving water standards (Delaware River) of BOD removal of greater than 85 percent, turbidity of not greater than 30 units above river water, and absence of taste- and odor-producing substances.

The process will consist of chemical pretreatment with primary sedimentation, followed by activated sludge secondary treatment and a final polishing pond. Tertiary treatment studies with activated carbon are also contemplated to determine the extent to which the secondary effluent will lend itself to tertiary treatment.

Operating data of the system is included and supplemented by discussion of individual unit operations and unit process performance. Evaluation of a full-scale wastewater recycle and reuse system is included.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EUX

TITLE OF PROJECT: Reuse of Chemical Fiber Plant Wastewater and Cooling Water Blowdown

GRANTEE OR CONTRACTOR:

Fiber Industries, Inc.
Box 10038
Charlotte, North Carolina 28201

EPA PROJECT OFFICER:

Dr. R. Thacker
Pollution Control Analysis Branch
Water Quality Research
Washington, D. C. 20242

Project Site: Shelby, North Carolina

DESCRIPTION OF PROJECT

Award Date: April 1968

Completion Date: September 1970

Project Cost: $500,000

Federal Cost: $350,000

Summary:

Demonstration studies were conducted to determine the feasibility of reusing industrial and domestic wastewaters from a FORTREL Polyester manufacturing plant. The wastewaters consisted of organic chemical process wastes, cooling system blowdown, and domestic wastewaters from the plant. Selected unit processes and operations were superimposed on an existing activated sludge system in an effort to improve the quality of the treated discharge. The cooling system blowdown was pretreated with sulfur dioxide in an acidic environment to remove the chromium. The cooling water biocides which passed through the chromium reduction unit were observed for their possible effect on the biological treatment system. A plastic media trickling filter was evaluated for its effectiveness as a roughing filter ahead of an activated sludge unit. The effluent from the secondary treatment system was filtered through a microscreen and treated with polymers and/or carbon to remove color, COD, dissolved and suspended solids.

The results of these studies indicate that chromium can be removed from the cooling tower blowdown for 21¢ per pound of chromate and that the type and concentration of biocides normally used in cooling water are either destroyed in the chromate reduction system or exhibit no adverse effect on the secondary and tertiary treatment system.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: ESG

TITLE OF PROJECT: Zinc Precipitation and Recovery from Viscose Rayon Wastewater

GRANTEE OR CONTRACTOR:

American Enka Corporation
Enka, North Carolina

EPA PROJECT OFFICER:

Mr. Edmond Lomasney
Region IV, EPA
1421 Peachtree Street, N.E.
Atlanta, Georgia 30309

Project Site: Enka, North Carolina

DESCRIPTION OF PROJECT

Award Date: May 24, 1968

Project Cost: $980,417

Completion Date: January, 1971

Federal Cost: $282,700

Summary: In May, 1968, the Industrial Pollution Control Branch of the Water Quality Office of EPA initiated a R&D grant with American Enka Company to perfect an improved process for the precipitation and recovery of soluble zinc in rayon manufacturing wastewaters. - In the production of viscose rayon, zinc sulfate is used as a component of the acid spinning bath. Zinc is lost in a dilute form at points where the acid spun yarns are washed with water and at various points in the spinning bath system. The novel zinc recovery system involves initial neutralization of the waste stream to pH 6.0, sedimentation of insolubles, crystallization of zinc hydroxide in a high pH environment, sedimentation of zinc hydroxide, and solubilization of the zinc with sulfuric acid. - This novel recovery system was operated at a 600-1000 gpm rate with 70-120 mg/l of Zn in the feedwater. The system can maintain an effluent concentration of Zn less than 1 mg/l, which corresponds to 98-99% removal efficiency. The unique zinc hydroxide sludge is easily concentrated to 5-7% solids by sedimentation and to 10% solids by centrifugation. The sludge particles obtained by this process are spheroids of 4-8 microns average diameter, while normally precipitated sludge particles resemble curved platelets about 2 microns in diameter. - A daily recovery of 2,000 pounds of zinc assures recovery of the 12.5 to 14.0¢/lb of Zn operating and maintenance costs. The cost of zinc oxide purchased by Enka amounts to 15.6¢/lb of equivalent Zn.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: GLP

TITLE OF PROJECT: Air Flotation - Biological Oxidation of Synthetic Rubber and Latex Wastewater

GRANTEE OR CONTRACTOR:

Firestone Tire and Rubber Co.
Synthetic Rubber and Latex Div.
381 W. Wilbeth Road
Akron, Ohio 44317

EPA PROJECT OFFICER:

George Putnicki
Region VI, EPA
1402 Elm Street
Dallas, Texas 75202

Project Site: Lake Charles, Louisiana

DESCRIPTION OF PROJECT

Award Date: February 1, 1971

Completion Date: August 31, 1972

Project Cost: $1,872,501

Federal Cost: $392,288

Summary: The operation of a secondary wastewater treatment system at Firestone's Lake Charles, Louisiana Synthetic Rubber Plant was studied for a nine-month period. The system was designed to reduce the five-day Biochemical Oxygen Demand (BOD_5) by 90 percent to a 7 mg/l level and reduce Suspended Solids by 95 percent to a 10 mg/l level. An average BOD_5 reduction of 84.2 percent and Suspended Solids reduction of 85.2 percent was accomplished during the demonstration period.

The raw wastewater flow is 3.55 million gallons per day, and consists primarily of salt brine, dilute acid wastes, boiler water blowdown, dilute latex, and coagulated rubber solids. The average raw waste concentrations are: BOD_5, 72 mg/l; Chemical Oxygen Demand (COD), 447 mg/l; Suspended Solids, 197 mg/l.

The wastewater treatment system includes neutralization, coagulation and flocculation, primary clarification, biological treatment, final clarification and sludge impoundment. Primary and secondary clarification is accomplished by dissolved air flotation. A completely mixed aerated lagoon provides the necessary biological treatment.

The treatment plant cost was $1,473,000. The total project cost was approximately $2,000,000, since it was necessary to separate process wastewater from storm water. This separation was necessary to avoid treating large quantities of rain water contaminated with process wastewater. The average operational, maintenance, and depreciation costs were $0.499 per 1,000 gallons of wastewater treated.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: GUT

TITLE OF PROJECT: Industrial Wastewater Renovation Plant, The General Tire and Rubber Company, Odessa, Texas

GRANTEE OR CONTRACTOR:

The General Tire & Rubber Co.
Odessa, Texas

EPA PROJECT OFFICER:

Mr. George Putnicki
Region VI, EPA
1402 Elm Street
Dallas, Texas 75202

Project Site: Odessa, Texas

DESCRIPTION OF PROJECT

Award Date: December 30, 1970

Project Cost: $938,680

Completion Date: June, 1973

Federal Cost: $461,890

Summary:

The proposed project is to demonstrate the applicability of a vertical tube evaporator (VTE) distillation plant for the renovation of organics containing industrial wastewater.

The chemical waste effluent emanating from the General Tire and Rubber Company Synthetic Rubber Plant, Odessa, Texas, at rates up to 750,000 gpd, contains dissolved solids, mostly sulphates and chlorides in concentrations up to 7,000 ppm in addition to organics in excess of 100 ppm. The proposed VTE plant will be used to obtain high quality water for reuse. The residual concentrated brine will be disposed of by means of the existing 90-acre pvc-lined evaporation ponds.

This grant is intended to demonstrate the applicability of VTE to the renovation of organics containing industrial waste effluents providing high quality recycle water and the substantial reduction of the waste for ultimate disposal to a practical volume. This system will have applicability to a wide spectrum of industrial plant effluents, including those where reduction of effluent to complete dryness is desired.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: PCO

TITLE OF PROJECT: Activated Sludge Treatment of Nylon Wastewaters Using Enriched Air

GRANTEE OR CONTRACTOR:

Beaunit Fibers
Etowah, Tennessee 37331

EPA PROJECT OFFICER:

Mr. Thomas N. Sargent
Southeast Environmental Research Lab.
College Station Road
Athens, Georgia 30601

Project Site: Etowah, Tennessee

DESCRIPTION OF PROJECT

Award Date: February 25, 1972

Completion Date: June, 1973

Project Cost: $338,807

Federal Cost: $136,927

Summary: The grantee will design, construct and operate an activated sludge system for the treatment of Nylon 6.6 wastewaters. The activated sludge will be aerated using off gases from the manufacturing process containing 40% available oxygen. The system will be designed for a 150,000 gpd flow with a biochemical oxygen demand of 1124 pounds per day. Water Quality Standards require that the system operate with removal efficiencies in excess of 92%.

The treatment system will be operated for a 12 month period during which time raw waste characteristics, treatment process parameters and cost of treatment will be monitored and evaluated.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 801173

TITLE OF PROJECT: A Demonstration of a Closed Loop Reuse System for the Fiberglas Textile Industry

GRANTEE OR CONTRACTOR:
Owens-Corning Fiberglas Corp.
Fiberglas Tower
Toledo, Ohio 43659

EPA PROJECT OFFICER:
Mr. Sam H. Thomas
Director, Environmental Services

Project Site: Owens Corning Fiberglas Corporation, Staff Road, Anderson, S.C.

DESCRIPTION OF PROJECT

Award Date: May 15, 1973

Project Cost: $986,000

Completion Date: May 14, 1976

Federal Cost: $246,640

Summary: The project objective is to completely recirculate a complex industrial wastewater, into non-process uses such as washdown, chain scrubbing, and cooling. To accomplish this objective of total wastewater recirculation, it is necessary to:

a. Establish the level of water quality required for various water uses in the plant;
b. Provide additional local water conditioning and recycle facilities for cooling, scrubbing, and chainwashing;
c. Improve wastewater treatment such that the remaining wastewater may be reused for floor washing, quenching, and cooling.

Preliminary studies have been underway since 1969 on various aspects of the total project.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 801200

TITLE OF PROJECT: Waste Water Profile of Plastics, Synthetic Resins, and Fiber Manufacturing Industry

GRANTEE OR CONTRACTOR:

University of Massachusetts
Chemical Engineering Department
Amherst, Massachusetts 01002

EPA PROJECT OFFICER:

Mr. Paul E. des Rosiers
EPA, Headquarters
Washington, D. C. 20460

Project Site: Amherst,, Massachusetts

DESCRIPTION OF PROJECT

Award Date: June 29, 1972

Project Cost: $31.405

Completion Date: September 1974

Federal Cost: $29,835

Summary: The goal of this project is to prepare a detailed profile of the waste water effluents of the plastics, synthetic resins, and fiber manufacturing industries. In addition to the chemical profile of the liquid waste streams, information will be developed on the treatment facilities currently used or in some cases planned, and an estimate, if available, of the waste reductions currently achieved by existing technology.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

FINAL REPORTS AVAILABLE

RUBBER AND PLASTIC PRODUCTS

REPORT NUMBER	TITLE/AUTHOR	SOURCE
12090 EUX 10/70	Reuse of Chemical Fiber Plant Waste Water and Cooling Water Blowdown, Fiber Industries, Inc., Charlotte, North Carolina and Davis and Floyd Engineers, Inc., Greenwood, South Carolina	GPO - $0.70
12090 ESG 01/71	Zinc Precipitation and Recovery From Viscose Rayon Wastewater, American Enka Co., Enka, North Carolina	GPO - $1.00
12020 DJI 06/71	Wastewater Treatment Facilities For a Polyvinyl Chloride Production Plant, B. F. Goodrich Chemical Company, Cleveland, Ohio 44115	GPO -
EPA 660/2-73-018	Air Flotation - Biological Oxidation of Synthetic Rubber and Latex Wastewater, Firestone Tire & Rubber Company, Lake Charles, Louisiana.	GPO - $1.60

TEXTILE MILL PRODUCTS

The textile program area is defined as the TR (technology research) oriented to providing those establishments engaged in - preparation of fiber and manufacture of yarn, thread, braids, twine, cordage, felt, lace, nonwoven fabrics, miscellaneous textiles woven and knit fabric, carpet and rugs; dyeing and finishing of fabric, yarn, knit and fibers; treating fabrics; the integrated manufacture of knits and other articles from yarn - with economically viable technology to meet the effluent standards for point source discharge.

The industry is delineated by SIC Major Group 22 and as of 1967, had nearly 7100 plants, of which 684 account for 95% of the water use, employ about 414,000 people and had a value added by manufacturing of 3.73 billion dollars.

For research purposes the industry can be sub-categorized according to type of product and manufacturing operations. Such a rationale gives the following subcategorization: Wool Scouring (2297); Wool Finishing (2231, 2283); Greige Goods (2211, 2221, 2241); Woven Fabric Finishing (2261, 2262); Knit Fabric Finishing (225); Carpet Mills (227); Stock and Yarn Finishing (2269, 2281, 2282, 2284).

An initial second order breakdown shows that two subcategories - Wool Scouring and Greige Goods do not dye and finish textiles while the remaining five subcategories do.

The Wool Scouring subcategory is significantly distinguished from other subcategories because of the unique wet cleaning process employed to remove grease and other impurities from the wool fiber prior to fiber finishing. The wool grease constitutes a water quality problem since it is not readily compatible with bioboxidation and adsorption technologies.

The Greige Goods subcategory is distinguished from other subcategories because of the absence of any dyeing or finishing operations. A greige goods mill processes fiber into woven or knit fabric and basic yarn into either spun or texturized yarn. All of the products are unbleached, "grey" in color (greige) and must subsequently be dyed and finished to suit the customer. There is an exception to these typical operations because the industry has the majority of the knitting mills integrated with the latter discussed - Knit Fabric Finishing subcategory. The spinning and texturizing of yarns is a dry operation but because of the normal spills and maintenance activities it is possible to have a lubricating oil, similar to mineral oil present in wastewaters. The weaving of fiber or yarn into a fabric requires the use of a wet process known as slashing (sizing) while on the other hand, slashing is not necessary for the knitting of fabrics. The application of a size adds stiffness to the yarn so as to resist the mechanical abrasion of the weaving operation. Again, because of process clean-ups blowdown and spills, wastewaters from the sizing operation are present. The wastewaters contain quantities of SS, TDS, and dissolved organics.

The remaining subcategories - Wool Finishing, Woven Fabric Finishing, Knit Fabric Finishing, Carpet and Rugs, and Stock and Yarn Finishing - are related in that they take greige goods and/or scoured wool and dye-finish the fabric or yarn. In preparation for dyeing the materials are subjected to combinations of the following wastewater producing operations: desizing, bleaching, scouring, mercerizing for cellulosics, and carbonizing and separate rinsing following fulling for wool. Unique to the finishing of woven fabrics is the desize and related rinsing operations needed to strip the sizing agent. Each of these pre-dyeing operations has a wastewater discharge and characteristic water quality constituents.

The most significant pre-dyeing operation in terms of wastewater volume and organic loading is the desizing of woven goods. The sizes are degraded and/or solubilized so as to permit their removal from the fabric through washing and rinsing. The normally high volume discharge of rinse waters, and small quantities of blowdown from batch solubilizing operations constitutes the wastewater source.

Carbonizing is a chemical process for eliminating impurities (cellulosic matter) from wool by degrading the cellulosic material with acid and subjecting the now friable impurities to heat. A hydrochloric acid gas (dry process) or sulfuric acid solution (wet process) is used. The wet process acid bath dump is the source of wastewater. Water quality constituents of concern are acidity, SS, TDS, and dissolved organics.

Fulling is a dry pre-dyeing operation for woolen knit or woven fabric. However, it is followed by a high volume rinsing sequence which is utilized to prevent rancidity and spoilage of the wool. This rinse wastewater can be a significant portion (50%) of the hydraulic flow from a wool finishing plant.

In scouring, the textile is treated in aqueous or solvent solutions in order to remove impurities such as fats, waxes, proteins, dirt, oil, etc. The aqueous scouring operation may be batch or continuous in nature with wastewaters originating from liquor dumps, blowdown and the high volume rinses. The water quality constituents of concern are dissolved organics, SS, TDS, phosphates and heat.

Mercerizing is a fiber conditioning process for cellulosic yarn, fabric, and blends whereby the fibers are swollen, the strength and dye affinity of the materials are increased and their handle is modified. The process involves both swelling in caustic soda baths, stretching, subsequent neutralization with acid and rinsing. The process is normally continuous with blowdown and rinsewaters the potential source of wastewater. Water quality constituents of concern are the SS, TDS, and alkalinity.

In bleaching, a chemical reagent, capable of partly or completely destroying the natural coloring of textile fibers and rendering them white or otherwise lighter in color, is employed. The dumping of batch bleach liquors, blowdown from continuous units and subsequent rinses are the source of wastewaters. The use of reducing agents for bleaching mainly woolens has in recent years fallen out of use. Wastewaters from the bleaching operation contain quantities of SS, TDS, and alkalinity.

The dyeing operations, which have been preceded by combinations of the referenced preparation processes, can be classified based on the application technology. This yields 9 major classes each one having characteristic process-application factors and hence wastewater features. In addition, these dyes may be mechanically applied using any one of several types of dyeing machines each one having potentially different water requirements. Some machines are pressurized - the others are atmospheric in nature with the pressurized systems having lower water needs. Dyeing systems are either batch or continuous operations with continuously using less water and no concentrated dumps. All aqueous dyeing is done at elevated temperatures and is followed by drying. Printing, which is also a significant type, uses an aqueous or solvent based paste which ultimately is the source of concentrated but lower volume wastewater. As implied, the qualitative and quantitative characteristics of dye wastewaters is most difficult to define because of the many variables. Generally speaking, dissolved organics, SS, TDS, alkalinity/acidity, color, metals, phenols, toxics, and heat are the potential water quality characteristics of concern. The dumping of batch dye liquors, the blowdown from continuous dye baths and the discharge of rinse waters are the wastewaters sources.

The R&D program for the textile industry initiates research efforts under the grant, contract, and in-house provisions of PL 92-500, Section 104 and 105.

The objective of the program is to develop and demonstrate technology which will result in the elimination of the discharge of pollutants.

The objectives are met through a R&D planning function located at EPA Headquarters, Washington, D. C. and an implementation program located at the Southeast Environmental Research Laboratory in Athens, Georgia.

PROJECT INDEX

TEXTILE MILL PRODUCTS

	Grantee or Contractor	Project Status
ECU	North Carolina State University	A
ECS	Clemson University	A
EOX	Clemson University	A
EOE	North Carolina State University	A
FWD	American Association of Textile Chemists and Colorists	A
FZB	Georgia Institute of Technology	A
DWM	C. H. Masland and Sons	A
EQO	Palisades Industries, Incorporated	A
EGW	Holliston Mills, Incorporated	B
HLO	Cone Mills Corporation	B
HFK	State of Massachusetts	A
800294	North Carolina State University	A
800852	Canton Textile Mills	B
800929	LaFrance Industries	B
801192	Blue Ridge Winkler Textiles	B
801211	J. P. Stevens and Company Incorporated	B
SFCP 05-532-3	Institute for Meterology and Water Management	
802586	Bennett College	B
802973	S. C. Textile Manufacturers Association	B
803174	American Dye Manufacturing Institute	B

Project Status:
A - Completed, Final Report Available
B - Project Ongoing
C - Project Discontinued

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: ECU

TITLE OF PROJECT: Textile Based Water Pollution-Information Study

GRANTEE OR CONTRACTOR:

Department of Textile Chemistry
North Carolina State University
Raleigh, North Carolina 27607

EPA PROJECT OFFICER:

Mr. Harold Snyder
Water Quality Research, EPA
Washington, D. C. 20242

Project Site: Raleigh, North Carolina

DESCRIPTION OF PROJECT

Award Date: May 9, 1969

Project Cost: $12,638

Completion Date: June 1971

Federal Cost: $10,410

Summary:

This project involves the collection, abstracting and indexing of all available literature dealing with water pollution from textile based sources and the preparation and storage of this information into the Water Resources Scientific Information System. Information will also be correlated between the Water Resources Scientific Information Center, USDI, the M.I.T. Textile Center, and the Shirley Institute thesauri.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: ECS

TITLE OF PROJECT: Survey of the State-of-the-Art of Textile Waste Treatment

GRANTEE OR CONTRACTOR:

Department of Textiles
School of IM & TS
Clemson University
Clemson, South Carolina 29631

EPA PROJECT OFFICER:

Mr. Thomas N. Sargent
Southeast Environmental Research
Laboratory, EPA
College Station Road
Athens, Georgia 30601

Project Site: Clemson, South Carolina

DESCRIPTION OF PROJECT

Award Date: June 24, 1969

Completion Date: March 30, 1971

Project Cost: $31,675

Federal Cost: $30,007

Summary:

The study will include characterization of the liquid wastes from the major manufacturing processes with respect to composition and quantity per unit of production, identification of successful and unsuccessful treatment processes and disposal practices presently in use, and suggestion of alternatives for least satisfactory practices. The study will be directed towards identifying areas most in need of research and those areas where research effort is most likely to yield beneficial results.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EOX

TITLE OF PROJECT: A Study of the Photochemical Degradation of Commercial Dyes

GRANTEE OR CONTRACTOR:

Department of Textiles
Clemson University
Clemson, South Carolina

EPA PROJECT OFFICER:

Dr. A. W. Garrison
Southeast Environmental Res. Lab.
College Station Road
Athens, Georgia 30601

Project Site: Clemson, South Carolina

DESCRIPTION OF PROJECT

Award Date: August 20, 1969

Completion Date: May 31, 1971

Project Cost: $34,040

Federal Cost: $31,539

Summary:

The objectives of this 12 month research project are to define and characterize the products of decomposition resulting from ultraviolet radiation of selected commercial textile dyes. The characterization will include distinguishing between photochemical and hydrolytically produced decomposition products.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EOE

TITLE OF PROJECT: Water Pollution Reduction Through Recovery of Desizing Wastes

GRANTEE OR CONTRACTOR:

Department of Textile Chemistry
North Carolina State University
Raleigh, North Carolina 27606

EPA PROJECT OFFICER:

Mr. Harold Snyder
Water Quality Research, EPA
Washington, D. C. 20242

Project Site: Raleigh, North Carolina

DESCRIPTION OF PROJECT

Award Date: October 6, 1969

Project Cost: $39,688

Completion Date: August 5, 1971

Federal Cost: $35,833

Summary:

The objectives of this 12 month research project are to investigate processes for the recovery of desizing wastes in solid or concentrated form suitable for disposal and to investigate processes for the recovery of desizing wastes in a reusable form. The wastes studies will be those from fabrics sized with carboxymethylcellulose (CMC), polyvinyl alcohol (PVA), and starch. In addition, data will be collected concerning the biodegradability of the synthetic sizes.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: FWD

TITLE OF PROJECT: A Study of Gamma Induced Oxidation of Textile Effluents

GRANTEE OR CONTRACTOR:

American Assoc. of Textile
Chemists and Colorists
P. O. Box 12215
Research Triangle Park, North Carolina

Project Site: Oak Ridge, Tennessee

EPA PROJECT OFFICER:

Mr. Edmond Lomasney
Region IV, EPA
1421 Peachtree Street, N.E.
Atlanta, Georgia 30309

DESCRIPTION OF PROJECT

Award Date: May 13, 1970

Completion Date: September 12, 1971

Project Cost: $50,000

Federal Cost: $47,500

Summary:

During the project period, work will be initiated to further develop and optimize a high-pressure, radiolytic oxidation system. The oxidation system is of laboratory-scale size and has initially been involved in joint FWQA/ORNL (Oak Ridge National Laboratory) experiments. Textile mill wastes, such as dyes, special finishing compounds, and other refractory wastes, will be subjected to the treatment system. Information from the pilot-scale demonstration will be collected concerning optimum operating conditions, radiation dose, temperature, pressure, and cost of treatment for various types and concentrations of waste.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: FZB

TITLE OF PROJECT: Dyestuff Color Removal by Ionizing Radiation and Chemical Oxidation

GRANTEE OR CONTRACTOR:

Engineering Experiment Station
Georgia Institute of Technology
Atlanta, Georgia 30332

EPA PROJECT OFFICER:

Mr. Edmond Lomasney
Region IV, EPA
1421 Peachtree Street, N.E.
Atlanta, Georgia 30309

Project Site: Atlanta, Georgia

DESCRIPTION OF PROJECT

Award Date: October 16, 1970

Project Cost: $37,685

Completion Date: October 15, 1971

Federal Cost: $35,801

Summary:

This 12 month project will investigate the feasibility of a method of treatment dependent on the effects of a combination of ionizing radiation and variety of chemical oxidants on textile dye wastes. The degraded products will be examined with regard to BOD, COD, TOC, color removal, biodegradability, and toxicity to treatment plant biota. A conceptual engineering design will be proposed and a preliminary estimate of treatment costs for a typical dye waste will be made.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DWM

TITLE OF PROJECT: Bio-Regenerated Activated Carbon Treatment of Textile Dye Wastewater

GRANTEE OR CONTRACTOR:

C. H. Masland & Sons
Wakefield, Rhode Island

EPA PROJECT OFFICER:

Mr. Donald R. Smith
New England Basins Office, EPA
240 Highland Avenue
Needham Heights, Massachusetts 02194

Project Site: Wakefield, Rhode Island

DESCRIPTION OF PROJECT

Award Date: April 15, 1969

Project Cost: $39,450

Completion Date: January 14, 1971

Federal Cost: $27,615

Summary:

In the final report to this project a novel approach to treating a highly colored textile dyeing waste effluent is described. It comprises the removal by sorption of color bodies and other organic matter on activated carbon granules. Spent carbon granules are then subjected to a virule aerobic biological culture which desorbs and bio-oxidizes the desorbed matter, thereby regenerating the carbon for subsequent new sorption steps. - Laboratory confirmation of the phenomenon is presented in the final report. Field testing of the treatment process concept in a 50,000 gpd plant installed at a yarn spinning mill (C.H. Masland & Sons, Wakefield, Rhode Island) is also reviewed. - Color removal was virtually complete at two flow rates evaluated: 8.5 gpm/sq. ft. and 15.6 gpm/sq. ft. carbon column bed flow. TOC removal was 85 percent or higher at 8.5 gpm/sq. ft. and only 48 percent at 15.6 gpm/sq. ft. - It was demonstrated that activated carbon had an adsorption capacity in excess of 3/4 pound TOC per pound of carbon when the carbon was reactivated only by biological means. The estimated operating cost for decolorizing 1,000,000 gpd is 8.3 cents/1000 gallons.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EQO

TITLE OF PROJECT: Demonstration of a New Process for the Treatment of High Pollutant Concentration Textile and Finishing Wastes

GRANTEE OR CONTRACTOR:

Palisades Industries, Inc.
2 Columbia Street
Peace Dale, Rhode Island 02883

EPA PROJECT OFFICER:

Mr. Donald R. Smith
New England Basins Office, EPA
240 Highland Avenue
Needham Heights, Mass. 02194

Project Site: Peace Dale, Rhode Island

DESCRIPTION OF PROJECT

Award Date: October 3, 1969

Project Cost: $143,750

Completion Date: September 2, 1971

Federal Cost: $ 64,687

Summary:

The project will demonstrate the effectiveness of a pilot-scale treatment system which would adequately treat a 50,000 gpd waste flow from a textile dye mill. The system consists of an aerated equalization basin, an anaerobic activated carbon unit, an aerobic activated carbon unit and an activated sludge regeneration unit.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EGW

TITLE OF PROJECT: Treatment of Cotton Textile Waste by Enzymes and High Rate Trickling Filter System

GRANTEE OR CONTRACTOR:

Holliston Mills, Inc.
111 Lenox Street
Norwood, Mass. 02060

EPA PROJECT OFFICER:

Mr. Edmond Lomasney
Region IV, EPA
1421 Peachtree Street, N.E.
Atlanta, Georgia 30309

Project Site: New Canton, Tennessee 37662

DESCRIPTION OF PROJECT

Award Date: December 12, 1969

Project Cost: $285,372

Completion Date: December 31, 1972

Federal Cost: $144,741

Summary:

The industry concerned purchases cotton greige goods and produces high-grade book bindings. The manufacturing processes which produce a waste flow are desizing, caustic extraction, bleaching, dyeing, and sizing. The applicant proposes to substitute an enzyme desizing chemical in the desizing process which will reduce the pH and BOD load of the waste stream. A treatment system employing a primary clarifier, high-rate trickling filter with plastic media, and a secondary clarifier will be used to treat the waste flow. The sludge from the treatment system will then be subjected to an enzyme reaction which will render it amenable to further biological oxidation.

The effectiveness of the manufacturing process change and the operating characteristics and efficiency of the trickling filter and sludge handling system will be evaluated.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: HLO

TITLE OF PROJECT: Catalyzed Bio-oxidation and Clarification of Integrated Textile Wastes for Process Water Reuse

GRANTEE OR CONTRACTOR:

Cone Mills Corporation
Greensboro, North Carolina 27405

EPA PROJECT OFFICER:

Mr. Thomas Sargent
Southeast Environmental Res. Lab.
College Station Road
Athens, Georgia 30601

Project Site: Greensboro, North Carolina

DESCRIPTION OF PROJECT

Award Date: August 17, 1971

Project Cost: $115,250

Completion Date: September 17, 1972

Federal Cost: $ 79,415

Summary:

In an effort to satisfy stream water quality standards of 99% BOD_5 reduction, a 99+% nitrogen and phosphate reduction, and a 98% and 96% reduction in COD and suspended solids respectively, the grantee will design, operate and evaluate a pilot scale system to achieve these tertiary levels of treatment. During this 13 month project, three variations of an activated carbon catalyzed bio-oxidation process will be evaluated. The variations involve the use of various coagulant acids.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: HFK

TITLE OF PROJECT: Grease Removal and Pilot-Scale Biological Oxidation of Wool Scouring Wastewaters

GRANTEE OR CONTRACTOR:

Division of Water Pollution Control
Commonwealth of Massachusetts
100 Cambridge Street
Boston, Massachusetts 02202

EPA PROJECT OFFICER:

Mr. Thomas Sargent
Southeast Environmental Res. Lab.
College Station Road
Athens, Georgia 30601

Project Site: South Barre, Massachusetts

DESCRIPTION OF PROJECT

Award Date: June 30, 1971

Project Cost: $162,000

Completion Date: July 30, 1972

Federal Cost: $ 98,482

Summary:

Elevated temperature acid-cracking combined with pilot activated sludge and lagoon treatment were utilized to treat effluent wastewater from a woolen processing plant. Effluent from woolen "top" (raw wool scouring) making is very high in BOD, COD, and suspended solids (18,880 ppm, 60,600 ppm, 37,600 ppm, respectively). The chemical/physical system consisted of a hot acid-cracking process to reduce the grease content in the influent to the biological system. Average grease reductions were from 13,400 ppm to 120 ppm or 99 percent with a BOD reduction of 70 percent and COD reduction of 80 percent. The biological system consisted of a pilot extended aeration activated sludge unit with clarification and retention in a pilot facultative lagoon (53 days retention). Typical BOD and COD reductions in the activated sludge/clarification unit were 83 percent and 54 percent, respectively, and in the lagoon 56 percent and 54 percent, respectively.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 800294

TITLE OF PROJECT: Recovery and Reuse of Synthetic Size from Textile Finishing Wastewaters

GRANTEE OR CONTRACTOR:

Department of Textile Chemistry
North Carolina State University
Raleigh, North Carolina 27607

EPA PROJECT OFFICER:

Mr. Thomas N. Sargent
Southeast Env. Research Lab.
EPA, College Station Road
Athens, Georgia 30601

Project Site: Raleigh, North Carolina

DESCRIPTION OF PROJECT

Award Date: February 23, 1972

Project Cost: $72,771

Completion Date: February 22, 1973

Federal Cost: $48,043

Summary:

The objective of this 12 month project is to demonstrate in pilot scale, a process for the removal and recovery of carboxymethyl cellulose size from textile finishing wastewaters. Previous studies under EPA Grant Project 12090 EOE have identified the technical and economic feasibility of removing, recovering, and reusing the CMC size. The size will be removed from dilute concentrations by chemical precipitation using alum. Reuse tests will be conducted to further evaluate and demonstrate the reuse potential of the recovered material. A final report will be prepared concerning all aspects of the project.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 800852

TITLE OF PROJECT: Optimum Treatment of Textile Finishing Wastes - Neutralization and Color Reduction

GRANTEE OR CONTRACTOR:

Canton Textile Mills
Canton, Georgia 30114

EPA PROJECT OFFICER:

Mr. Thomas N. Sargent
Southeast Env. Res. Lab, EPA
College Station Road
Athens, Georgia 30601

Project Site: Canton, Georgia

DESCRIPTION OF PROJECT

Award Date: April 3, 1972

Project Cost: $364,511

Completion Date: October 2, 1973

Federal Cost: $209,811

Summary:

Canton Textile Mills will demonstrate a system whereby the biological oxidation of textile finishing wastes will be supplemented with flue gas neutralization of the waste stream for control of pH, and fly ash adsorption for the control of color. The pretreatment and tertiary treatment processes will augment an optimized biological oxidation system capable of producing an effluent of 30 mg/l BOD & SS. The entire waste treatment system will be designed to treat a 550,000 gallon per day waste flow and will be operated for a 12 month period during which time operating characteristics will be documented and evaluated.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 800929

TITLE OF PROJECT: Treatment and Reuse of Textile Dye House Wastewaters Using Reverse Osmosis

GRANTEE OR CONTRACTOR:

LaFrance Industries
LaFrance, South Carolina 29631

EPA PROJECT OFFICER:

Mr. Thomas N. Sargent
Southeast Env. Research Lab., EPA
College Station Road
Athens, Georgia 30601

Project Site: LaFrance, South Carolina

DESCRIPTION OF PROJECT

Award Date: June 12, 1972

Project Cost: $293,350

Completion Date: February, 1974

Federal Cost: $198,812

Summary:

This 12 month project will demonstrate in pilot scale the technical feasibility of employing membrane technology for the treatment and control of textile dyehouse wastewaters. Pilot scale reverse osmosis units will evaluate the use of cellulose acetate and dynamic membrane systems for the separation of dissolved solids and color concentrates. The resulting retentate and permeate from the membrane units will be evaluated for recycle and reuse potential in the dyeing processes.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 801192

TITLE OF PROJECT: Activated Sludge and Alum Precipitation of Textile Dye and Finishing Wastewaters

GRANTEE OR CONTRACTOR:

Blue Ridge-Winkler Textiles
Bangor, Pennsylvania 18013

EPA PROJECT OFFICER:

Mr. Thomas Sargent
Southeast Env. Res. Lab., EPA
College Station Road
Athens, Georgia 30601

Project Site: Bangor, Pennsylvania

DESCRIPTION OF PROJECT

Award Date: June 22, 1972

Project Cost: $264,615

Completion Date: September 21, 1973

Federal Cost: $ 96,156

Summary:

This 15 month project will demonstrate in full scale the operation of a newly constructed 750,000 gpd wastewater treatment facility for the treatment of textile dyeing and finishing wastewaters. The wastewaters originate from the dyeing and finishing of synthetic and blend yarns and exhibit high organic color content. The treatment system includes the following processes: equalization; nutrient and pH control; activated sludge including secondary sedimentation; alum coagulation consisting of rapid mixing, flocculation and final clarification; chlorination; and sludge dewatering. Preliminary plant operating data shows a potential for 95% reduction in BOD and a 90% reduction in color contaminants. The data collected will be sufficient to characterize the raw wastewater, to determine the operating characteristics of the unit processes (especially with respect to extent of color removal), to fully establish the system treatment capabilities, and to determine the cost of treatment under a variety of conditions.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 801211

TITLE OF PROJECT: Pollution Control Facilities, Phase II and Phase III

GRANTEE OR CONTRACTOR:

J. P. Stevens & Co., Inc.
Greensboro, North Carolina 27420

EPA PROJECT OFFICER:

Mr. Thomas Sargent
Southeast Environmental
Research Laboratory, EPA
College Station Road
Athens, Georgia 30601

Project Site: Basile, Louisiana

DESCRIPTION OF PROJECT

Award Date: April 1, 1973

Project Cost: $886,355

Completion Date: November 1975

Federal Cost: $179,347

Summary:

One objective of the project is to produce an effluent from a synthetic fabric finishing plant which will have a 5-day BOD and suspended solids of 5 mg/l or less and a minimum dissolved oxygen of 5 mg/l using multi-media filtration. A second objective of the project is to determine the feasibility of wastewater reuse in the manufacturing plant process. A pilot plant scale system consisting of an activated carbon tower and cation and anion exchange units will be evaluated. The activated carbon tower is to be designed so that the carbon can be replaced by organic scavenging ion exchange material if this is desirable.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: SFCP 05-532-3

TITLE OF PROJECT: Studies on Removal of Color, Detergents, and Other Refractory Substances from the Textile Wastewater

GRANTEE OR CONTRACTOR:

Institute for Meteorology and
Water Economy
Krakow, Poland

EPA PROJECT OFFICER:

Mr. Thomas N. Sargent
Southeast Env. Res. Lab., EPA
College Station Road
Athens, Georgia 30601

Project Site: Krakow, Poland

DESCRIPTION OF PROJECT

Award Date: February 5, 1973

Project Cost: $352,210

Completion Date: February, 1976

Federal Cost: $352,210

Summary:

To evaluate the effectiveness and economics of treatment afforded by several tertiary treatment processes operations as applied to biologically treated municipal textile wastewaters. This project will generate information useful to the U. S. and the international textile community. Many of the proposed treatment schemes have not been previously applied to textile wastes, especially in different combinations. This project, therefore, offers unique advantages. This project will evaluate the effectiveness and economics of treatment afforded by several tertiary treatment processes/operations as applied to biologically treated municipal/textile wastewaters. Seven unit processes are to be investigated separately and in various combinations including reverse osmosis, carbon adsorption, coagulation, media filtration, ion exchange, catalyzed chlorine oxidation, and ozone treatment. The information being generated will be useful for pollution abatement not only in the U. S., but also in the international community.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 802586

TITLE OF PROJECT: The Application of Cation and Anion Exchange Resins To Remove Textile Industrial Waste Azo Dyes and Permit the Reuse of Resulting Effluent

GRANTEE OR CONTRACTOR:

Bennett College
Chemistry Department
Greensboro, North Carolina 27420

Project Site: Greensboro, North Carolina

EPA PROJECT OFFICER:

Mr. Thomas N. Sargent
Southeast Environmental
Research Laboratory, EPA
College Station Road
Athens, Georgia 30601

DESCRIPTION OF PROJECT

Award Date: July 29, 1973

Completion Date: July 1974

Project Cost: $21,903

Federal Cost: $22,998

Summary:

The objective of this study is to investigate the use of cation and anion exchange resins to remove azo pollutants from industrial waste before such waste is introduced into rivers and streams. - The elution column chromatographic technique will be used in this investigation. Standard azo solutions representing the broad spectrum of textile azo dyes will be used. These dye solutions will be tested with anion, cation and polar exchange resins and their tandum combinations to see which resins and types give the best removal of mixtures of azo dyes. Concurrently these resins will be judged for the practicality of regeneration, the elutant reuse potential, and the economics elutant disposed. - Actual dye waste samples from textile mills will replace the synthetic standard azo-dyes (except for control purposes) as soon as possible.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 802973

TITLE OF PROJECT: Mobile Hyperfiltration Demonstration Laboratory

GRANTEE OR CONTRACTOR:

S.C. Textile Manufacturers Assoc.
1122 Lady Street
Columbia, South Carolina 29201

EPA PROJECT OFFICER:

Mr. Thomas N. Sargent
Southeast Env. Res. Lab., EPA
College Station Road
Athens, Georgia 30601

Project Site: Spartanburg, South Carolina

DESCRIPTION OF PROJECT

Award Date: May 1, 1974

Project Cost: $188,825

Completion Date: April, 1975

Federal Cost: $120,000

Summary:

It is the objective of this project to demonstrate the technical feasibility of the application of hyperfiltration technology to the renovation of textile industrial wastewaters. The technical feasibility and economic potential for direct reuse of both the purified product and the concentrated residue will be evaluated. Engineering data necessary for scale-up system design will be obtained. A mobile hyperfiltration laboratory, developed at the Oak Ridge National Laboratory for on-site tests with sewage effluent, will be used in this program. Samples of effluents from 14 selected mills will be processed, at Clemson University. Seven (7) industrial plants will then be selected for site visits by the mobile facility. The on-site testing will facilitate the direct involvement of industrialists in the evaluation of the direct recycle of the renovated wastewater.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 803174

TITLE OF PROJECT: Textile Dye Waste Characterization and Treatment

GRANTEE OR CONTRACTOR:

American Dye Manufacturers Institute
74 Trinity Place
New York, New York 10006

EPA PROJECT OFFICER:

Mr. Thomas N. Sargent
SERL - EPA
College Station Road
Athens, Georgia 30601

Project Site: Raleigh, North Carolina

DESCRIPTION OF PROJECT

Award Date: June 30, 1974

Project Cost: $108,000

Completion Date: June 29, 1975

Federal Cost: $ 55,000

Summary:

The objective of the project is three-fold: to characterize the waste from textile dyeing operations (as distinct from preparation or finishing): to evaluate biological oxidation, carbon adsorption, chemical oxidation and chemical coagulation as treatment methods for selected textile dye wastes; and to examine several combination methods of treatment as a first step in the development of treatment methods for textile dye wastes. - A compendium will be prepared describing the significant dye methods in use. From this a tabulation of important dye bath additives will be prepared and will include available information concerning the chemical characteristics of these materials. This compilation will provide a reference resource that will facilitate the study and characterization of dye waste as a waste separate and distinct from textile mill waste. - A selection of twenty important combinations of dye class, fiber, fiber form and application method will be made. Dyeings will be prepared using typical recipes for these selections and the waste from these dyeings will be studied for treatability by biological oxidation. These systems will be further studied for treatability by physical/chemical means, including carbon adsorption, chemical oxidation and chemical precipitation.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

FINAL REPORTS AVAILABLE

TEXTILE MILL PRODUCTS

Report Number	Title/Author	Source
12090 DWM 01/71	Bio-Regenerated Activated Carbon Treatment of Textile Dye Waste Water, C. H. Masland and Sons, Wakefield, Rhode Island.	GPO - $1.00
12090 ECS 02/71	State-of-the-Art of Textile Waste Treatment, Clemson University, Clemson, South Carolina.	GPO - $2.50
12090 EOE 01/72	Water Pollution Reduction Through Recovery of Desizing Wastes; by Dept. of Textile Chemistry, North Carolina State University, Raleigh, North Carolina	GPO - $0.60
12090 FZB 07/71	Dyestuff Color Removal by Ionizing Radiation and Chemical Oxidation: T. F. Craft, Engineering Experiment Station, Georgia Institute of Technology, Atlanta, Georgia 30337	GPO - $1.75
EPA-R2-73-260 May 1973 (12090 FWD)	Study of Gamma Induced Low Temperature Oxidation of Textile Effluents, F. Case, E. Ketchen, Oak Ridge National Lab, Oakridge, Tn.	GPO - $0.65
EPA-660/2-73-036 January 1974	Chemical/Physical and Biological Treatment of Wool Processing Wastes, L. Hatch, R. Sharpin, Metcalf & Eddy, Boston, Mass.	GPO - $1.05
EPA-R2-73-248 May 1973	Anaerobic-Aerobic Treatment of Textile Wastes with Activated Carbon, C. Poon, P. Virgadamo, Fram Corporation, East Providence, Rhode Island.	GPO - $2.50
EPA-R2-73-058	A Study of the Photodegradation of Commercial Dyes, J. Porter, Clemson University, Clemson, South Carolina	GPO - $1.00

THERMAL POLLUTION

Of the four categories of water users in 1965, (1) Municipal, (2) Industrial, (3) Steam Electric Power, and (4) Agriculture-livestock; the steam-electric power water user was second largest with 85,000 mgd usage. Only agriculture was a larger user. In 1980 steam - electric power will be the largest user (193,000 mgd vs 138,000 mgd for agriculture - livestock).

While a number of public utility power producing and industrial power producing plants make use of cooling towers in order to reduce the amount of heat rejected into water, the majority of the existing plants make use of once-through cooling water and have no provision for water reuse. While some existing power plants are adding cooling towers, ponds, and canals, all new plants are making provisions for water reuse as part of the original installation. Each existing power producing facility and its associated ecosystem must be evaluated on a case-by-case basis in order to determine whether such devices as cooling towers need to be added in order to comply with regulations being promulgated.

The projects listed here cover technology areas suitable for once-through or reuse of cooling waters: they investigate the effects of water plumes in bodies of water, they determine the amount of drift coming from cooling towers, they evaluate beneficial uses of heated water in agriculture, or they assess other treatment methods related to power generation. If all the remaining power plants expressed a willingness to install equipment to reduce or eliminate thermal discharges, the optimum technology for each facility would still have to be evaluated on an individual basis. The underlying motivation for the R&D portion of the thermal pollution program is therefore to develop an array of technologies which can be used in the overall determination of the best pollution abatement methods for any given facility or plant.

The R&D program for the power industry receives support under the EPA grant and contract monies from PL 92-500. The objectives of the program are to:

1. Define the water pollution problem as it pertains to all of the aspects of power production including thermal.
2. Research, develop, and demonstrate the required technology to achieve, at minimum cost, the equivalent of best practicable and best available treatment, preferably with closed loop systems.

The project objectives are met through the awarding of grants and contracts to universities, industries, and municipalities and through in-house research activities carried out by the Pacific Northwest Environmental Research Laboratory.

The wastewater flows may be identified with the following power generating operations: boiler and cooling system blowdown, disposal of air pollution control system wastes, and disposal of water treatment wastewaters and sludges.

PROJECT INDEX

THERMAL POLLUTION

	Grantee or Contractor	Project Status
EIK	Eugene Water and Electric Board	A
EMQ	Purdue Research Foundation	A
FLM	Washington State University	A
FOK	Oregon State University	A
FSU	University of Minnesota	A
GNK	Environmental Systems Corporation	A
GSD	Environmental Systems Laboratory	A
HKK	Hittman Associates	A
800613	Vanderbilt University	A
801004	Vanderbilt University	A
801433	Maryland Department of Natural Resources	B
802044	Franklin Institute	B
802753	University of California - Berkeley	B
802853	Aerospace Corporation	B
803142	Franklin Institute	B
803196	Johnson County, Kansas	B
803207	R. W. Beck	B
803239	Stanford Research Institute	B
803257	University of California - Berkeley	B
803336	Novato (Marin County), California	B

	Grantee or Contractor	Project Status
68-03-0233	WAPORA, Inc.	A
68-03-0430	University of Iowa	B
68-03-2053	Acres American, Inc.	B

Project Status:
A - Completed, Final Report Available
B - Project On-going
C - Project Discontinued

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EIK

TITLE OF PROJECT: Thermal Water Demonstration Project

GRANTEE OR CONTRACTOR:

Eugene Water and Electric Board
500 E. 4th Avenue, P. O. Box 1112
Eugene, Oregon 97401

EPA PROJECT OFFICER:

Mr. Frank Rainwater
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Eugene, Oregon

DESCRIPTION OF PROJECT

Award Date: May, 1972

Completion Date: April, 1973

Project Cost: $160,580

Federal Cost: $99,900

Summary:

The objective of this project is to demonstrate beneficial uses to agriculture of water having sufficient heat to result in thermal pollution. The project will encompass the following areas: (1) Soil heating with thermal water, (2) Groundwater drain collection, (3) Water blending system, (4) Plant cooling, (5) Irrigation, (6) Environmental effects, and (7) Frost warning systems.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EMQ

TITLE OF PROJECT: Turbulent Bed Cooling Tower

GRANTEE OR CONTRACTOR:

Purdue Research Foundation
Lafayette, Indiana

EPA PROJECT OFFICER:

Dr. Shirazi
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Lafayette, Indiana

DESCRIPTION OF PROJECT

Award Date: February, 1972

Completion Date: December, 1972

Project Cost: $19,033

Federal Cost: $18,081

Summary:

This is a continuation grant to complete the development of a turbulent bed cooling tower for cooling power-plant condenser cooling water.

The turbulent bed is a cylindrical bed of low density spheres fluidized by ambient air and sprayed from the top with hot water.

In this portion of the project the pressure drop and cooling data will be checked and correlated. The turbulent bed will be equipped with an overhead fan so that cooling performance can be measured.

All information will be combined into a design of the tower and an economic analysis will be performed to indicate optimum design

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: FLM

TITLE OF PROJECT: Analysis of Engineering Alterantives for Environmental Protection from Thermal Discharges

GRANTEE OR CONTRACTOR:

Washington State University

EPA PROJECT OFFICER:

Mr. Frank Rainwater
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Seattle, Washington

DESCRIPTION OF PROJECT

Award Date: July, 1971

Project Cost: $33,582

Completion Date: June, 1972

Federal Cost: $30,041

Summary:

The objective of this project was to analyze and evaluate current and proposed engineering practices used in the protection of the water environment from the impact of thermal power systems.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the
Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: FOK

TITLE OF PROJECT: Controlling Thermal Pollution on Small Streams

GRANTEE OR CONTRACTOR:

School of Forestry
Oregon State University
Corvallis, Oregon 97331

EPA PROJECT OFFICER:

Mr. F. Rainwater
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Corvallis, Oregon

DESCRIPTION OF PROJECT

Award Date: July, 1970

Project Cost: $17,074

Completion Date: July, 1972

Federal Cost: $11,744

Summary:

Buffer strips have been proposed as a method for controlling temperature changes in streams adjacent to clear-cuttings. Nine small mountain streams in Oregon's Coast Range and Cascade Mountains were studied to determine the influence of buffer strips on water temperature. Timber volume in the strip, strip width, and canopy density perpendicular to the sun's rays were compared to the effectiveness of the strip in controlling temperature change. This effectiveness was not well correlated with timber volume or strip width. The density of the canopy in the path of the sun is the most important buffer strip characteristic for water temperature control.

A method for measuring the density of the canopy in the path of the sun is described. The use of this method in the design of buffer strips will provide protection for the stream and maximum harvesting of the timber resource.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: FSU

TITLE OF PROJECT: Mixing and Dispersion at a Warm Water Outlet

GRANTEE OR CONTRACTOR:

St. Anthony Falls Hydraulic Lab.
Mississippi River at 3rd Avenue, S.E.
Minneapolis, Minnesota 55414

EPA PROJECT OFFICER:

Dr. Mostafa A. Shirazi

Project Site: St. Anthony Falls Hydraulic Laboratory

DESCRIPTION OF PROJECT

Award Date: November, 1971

Project Cost: $45,231

Completion Date: October, 1972

Federal Cost: $43,066

Summary:

It is the objective of this research to continue an ongoing program to acquire information and develop methods for temperature and flow predictions in heated water effluents. In particular, efforts will be concentrated on solutions of the following problems.

a. To determine scale effects on flow and turbulent mixing in heated water surface plumes by acquisition of velocity and temperature data with laboratory results having identical densimetric outlet Froude numbers and downstream flow conditions.
b. To develop a temperature and velocity prediction method for heated water surface plumes which do not behave like buoyant surface jets.
c. To evaluate time-effects on dissipation of heat from thermal discharges. Temporary heat storage in natural bodies of water and resultant effects on "ambient" temperature surrounding plumes will be examined using one- and two-dimensional models.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: GNK

TITLE OF PROJECT: Explicit Calibration of the PILLS System

GRANTEE OR CONTRACTOR:

Environmental Systems Corporation
Suite 101, Parkway Building
1212 Pierce Parkway
Knoxville, Tennessee

Project Site: Knoxville, Tennessee

EPA PROJECT OFFICER:

Mr. Frank Rainwater
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

DESCRIPTION OF PROJECT

Award Date: March, 1972

Project Cost: $11,400

Completion Date:

Federal Cost: $10,800

Summary:

Environmental Systems Corporation proposes to refine, field test, and demonstrate instrumentation for monitoring and measuring particle size distribution and density of water droplets in drift from cooling towers.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: GSD

TITLE OF PROJECT: Proposed Stochastic Calculation of Water Equilibrium Temperature

GRANTEE OR CONTRACTOR:

Environmental Systems Lab

EPA PROJECT OFFICER:

Mr. Frank Rainwater
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Sunnyvale, California

DESCRIPTION OF PROJECT

Award Date: December, 1971

Project Cost: $39,100

Completion Date: July, 1972

Federal Cost: $39,100

Summary:

1. Formulate a mathematical model for heat exchange at the surface of the earth.
2. Examine the sensitivity of this model with respect to meteorological data.
3. Calculate the probability distribution of the equilibrium temperature for at least 4 separate time windows.
4. Provide a software program for calculation of equilibrium temperature.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: HKK

TITLE OF PROJECT: Thermal Pollution Control System Nomographs

GRANTEE OR CONTRACTOR:
Hittman Associates, Inc.

EPA PROJECT OFFICER:
Dr. B. Tichenor
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Columbia, Maryland

DESCRIPTION OF PROJECT

Award Date: March, 1972

Project Cost: $53,408

Completion Date: December, 1972

Federal Cost: $43,408

Summary:

Develop sets of monographs which shall be used to determine the costs and effectiveness of thermal pollution control alternatives. The nomograph shall be accompanied by descriptions of the processes covered, a description of the relationships used to prepare them, and illustrations of their use.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 800613 (16130 FDQ)

TITLE OF PROJECT: Project for Concentrated Research and Training in the Hydrologic and Hydraulic Aspects of Water Pollution Control

GRANTEE OR CONTRACTOR:

Vanderbilt University
Nashville, Tennessee 37203

EPA PROJECT OFFICER:

Mr. Frank Rainwater
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Nashville, Tennessee

DESCRIPTION OF PROJECT

Award Date: January, 1972

Project Cost: $121,000

Completion Date: December, 1972

Federal Cost: $108,000

Summary:

The major research effort will be on the hydraulic and hydrologic aspects of thermal pollution control. The field data on the discharge of heated waters into rivers will be analyzed and a topical completion report issued. A topical report on the warming of cold, hypolimnetic water discharged to streams will be completed. Optimal hydraulic design of cooling ponds will be investigated. The critical analysis of computer codes for computation of temperature distributions in reservoirs will be finished. A common format will be developed and a topical report issued. The bulk movement of heat and pollutants vertically in a stratified reservoir will be investigated in the field to provide transport coefficients for the various theoretical models now in use. The effects of shape, spacing, roughness, etc., of the fill of cooling towers will be studied. An analysis of evaporation formulas will be carried out and mechanisms of unifying them into a consistent whole will be attempted.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 801004

TITLE OF PROJECT: Abstract Preparation for the Water Resources Scientific Information Center

GRANTEE OR CONTRACTOR:
Vanderbilt University

EPA PROJECT OFFICER:
Mr. Frank Rainwater
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Nashville, Tenn.

DESCRIPTION OF PROJECT

Award Date: June, 1971

Project Cost: $65,370

Completion Date: June, 1972

Federal Cost: $35,354

Summary:

To serve the scientific and technical needs of scientists, engineers, and others interested in the field of Thermal Pollution with respect to available literature; (2) To establish Vanderbilt University as an information retrieval center for the area of Thermal Pollution; (3) To make this information available to the scientific community through the SELECTED WATER RESOURCES ABSTRACTS publication of the Water Resources Scientific Information Center, U. S. Department of the Interior; (4) To supply copies of requested abstracted articles at a nominal cost, when possible.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 801433

TITLE OF PROJECT: Power Plant Thermal Discharge Studies

GRANTEE OR CONTRACTOR:

Power Plant Siting Program
State of Maryland

EPA PROJECT OFFICER:

Mr. Frank Rainwater
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Annapolis, Maryland

DESCRIPTION OF PROJECT

Award Date:

Project Cost: $60,000

Completion Date:

Federal Cost: $51,600

Summary:

A program is proposed to carry out a comprehensive review of the state-of-the-art of various control measures for power plant thermal discharges. Control techniques will be assessed by applying them to specific situations within the State of Maryland; however, the conclusions of the proposed study will be quite general and will be applicable elsewhere.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 802044

TITLE OF PROJECT: Development of a Monthly Industrial Technical Bulletin

GRANTEE OR CONTRACTOR:
Franklin Institute Research Laboratories
20th and Race Street
Philadelphia, Pennsylvania 19103

EPA PROJECT OFFICER:
Mr. Charles Ris
Industrial Pollution Control Division (RD-679)
Washington, D. C. 20460

Project Site: Philadelphia, Pennsylvania

DESCRIPTION OF PROJECT

Award Date: May, 1973

Completion Date: June, 1974

Project Cost: $23,791

Federal Cost: $21,412

Summary:

Monthly Technology Bulletin Specifications:

1. Twelve monthly abstracts, first to be delivered 8 weeks after grant effective date.
2. Grant period 13 months.
3. Six executive summaries.
4. Final report consisting of a bound volume of all monthly abstracts and executive summaries plus index.
5. Distribution mailing list to include up to 500 addressees each month to be supplied prior to first monthly mailing.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 802753

TITLE OF PROJECT: Renovation of Industrial Wastewater by Evaporation with Interface Enhancement

GRANTEE OR CONTRACTOR:

University of California
Berkeley, California

EPA PROJECT OFFICER:

Mr. Richard B. Tabakin
Industrial Waste Treatment
Research Laboratory, EPA
Edison, New Jersey 08817

Project Site: Berkeley, California

DESCRIPTION OF PROJECT

Award Date: June, 1973

Completion Date: August, 1974

Project Cost: $29,615

Federal Cost: $25,000

Summary:

The objective of this project was to evaluate the increased heat transfer and other advantages which can be achieved with the use of a small amount of surfactant in the treatment of wastewaters by upflow vertical tube evaporation. The study involved the testing of typical inorganic wastewaters in a 5,000 gpd vertical tube evaporator.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 802853

TITLE OF PROJECT: Study of Power Plant Desulfurization Waste Waters for Reuse and Discharge

GRANTEE OR CONTRACTOR:

The Aerospace Corporation
P. O. Box 92957
Los Angeles, California 90009

EPA PROJECT OFFICER:

Mr. A. Christianson
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Los Angeles, California

DESCRIPTION OF PROJECT

Award Date: February, 1974

Project Cost:

Completion Date: February, 1975

Federal Cost: $59,000

Summary:

The Aerospace Corporation will conduct a program of experimentation and data analysis to determine the technical and economic potential for an allowable discharge of power plant desulfurization system water effluent or for its recycle/reuse in scrubbing and non-scrubbing applications. This program addresses one phase of a total consideration by the Environmental Protection Agency and the power industry for meeting the national goal of zero water pollution discharge by 1985. As an interim solution to this goal and in the absence of suitable technology, this program will consider the consequence of effluent water discharge to navigable waters as may be required. As assessment of water treatment technology will be made to determine the technical and economic basis for water reuse or discharge requirements. - The purpose of this program is to generate the technical and economic data from which EPA may respond to the requirements of the Federal Water Pollution Control Act Amendments of 1972 calling for interim effluent limitations. Additionally, the results of this program are expected to provide the basis for guidelines for the determination of the appropriate demonstration program necessary to verify the capabilities of control technologies available to effect the reuse or discharge of scrubber effluent waters.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 803142

TITLE OF PROJECT: Preparation of the Industrial Technology Bulletin

GRANTEE OR CONTRACTOR:

The Franklin Institute Research
Laboratories
20th and Race Street
Philadelphia, Pennsylvania 19103

EPA PROJECT OFFICER:

Mr. Charles H. Ris
Industrial Pollution Control
Division (RD-679), EPA
Washington, D. C. 20460

Project Site: Philadelphia, Pennsylvania

DESCRIPTION OF PROJECT

Award Date: June, 1974

Project Cost: $31,563

Completion Date: June, 1975

Federal Cost: $28,403

Summary:

The Franklin Institute Research Laboratories, Science Information Services Department, will provide key technical and administrative personnel, both government and non-government, with a current-awareness bulletin emphasizing advancements in the field of industrial technology as related to water quality and water pollution control. A monthly publication containing approximately 30 abstracts of articles pertinent to industrial technology will be prepared for and distributed to 750 recipients. Annual subject and author indexes, a journal list, and a compilation of each of the monthly bulletins will be included in the final report, along with camera-ready copy of the entire final report.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 803196

TITLE OF PROJECT: Recovery, Recycle, and Reuse of CO_2, Lime, and Magnesium in Potable Water Treatment

GRANTEE OR CONTRACTOR:

Water District #1 of Johnson County
5930 Beverly Street
Mission, Kansas 66202

EPA PROJECT OFFICER:

Mr. A. Christianson
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Water District #1 of Johnson County, Kansas

DESCRIPTION OF PROJECT

Award Date: October, 1974

Project Cost: $130,000*

Completion Date: October, 1975

Federal Cost: $267,785

Summary:

1. Objectives: (a) To study the feasibility of $CaCO_3$ flotation and magnesium compound production from highly turbid surface waters, (b) Provide design information, economic analyses, and process evaluation of unit operations to be applied to a broad range of surface waters.

2. Approach: The approach is to demonstrate the applicability of softener chemical recycle and reuse. Potentially, the objectives can reduce water treatment sludge handling volumes by as much as 80%. The demonstration plant will operate over a 12 month period. This time will allow for seasonal variations in raw water characteristics.

*First year cost only.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 803207

TITLE OF PROJECT: Economic Feasibility of a Direct, Air-Cooled Condenser System in a Coastal Environment

GRANTEE OR CONTRACTOR:

K. W. Beck and Associates
400 Prudential Plaza
Denver, Colorado 80202

EPA PROJECT OFFICER:

Mr. A. Christianson
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon

Project Site: Braintree, Mass.

DESCRIPTION OF PROJECT

Award Date: June, 1974

Project Cost: $40,000

Completion Date: June, 1975

Federal Cost: $38,000

Summary:

Objectives are:

1. Demonstrate the economic feasibility of a direct, air-cooled condensation system in a coastal environment.
2. Discuss design considerations for a direct, air-cooled condensation system in a coastal environment.
3. Evaluate turbine generator/dry tower performance, bus-bar power costs, and alternative hardware availability.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 803239

TITLE OF PROJECT: Review of Industrial Technologies - Research and Development Needs for Meeting the Requirements of PL 92-500

GRANTEE OR CONTRACTOR:

Stanford Research Institute
333 Ravenswood Avenue
Menlo Park, California 94025

EPA PROJECT OFFICER:

Mr. Marshall Dick
Industrial Pollution Control
Division (RD-679), EPA
Washington, D. C. 20460

Project Site: Menlo Park, California

DESCRIPTION OF PROJECT

Award Date: August, 1974

Completion Date: June, 1975

Project Cost: $75,275

Federal Cost:

Summary:

The objective of this study is to provide the Industrial Pollution Control Division with an assessment of the adequacy of the current industrial water pollution control research program for those industrial point sources specified in PL 92-500.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 803257

TITLE OF PROJECT: Renovation of Power Plant Cooling Tower Blowdown for Recycle by Evaporation-Crystallization with Interface Enhancement

GRANTEE OR CONTRACTOR:

University of California
Seawater Conversion Laboratory
1301 South 46th Street
Richmond, California 94804

EPA PROJECT OFFICER:

Mr. Alden Christianson
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Richmond, California

DESCRIPTION OF PROJECT

Award Date: August, 1974

Project Cost: $41,740

Completion Date: July, 1975

Federal Cost: $39,467

Summary:

This work is directed toward developing and demonstrating the feasibility of renovating cooling tower blowdown for its total recycle, and to producing a solid or slurried blowdown with evaporators of substantially reduced capital and operation-maintenance costs as compared to the best present practice. Specifically, the objectives are first to obtain test data on the concentration of real cooling tower blowdown with our existing 5,000 gpd VTE pilot plant, both without and after the addition of about 10 ppm of a selected surfactant, to the point of incipient crystallization of solutes. Secondly, the concentrated VTE blowdown will be foam fractionated to remove surfactant for recycle and particulate matter such as dust, and the concentrate will then be evaporated further in a forced-circulation, crystallizing evaporator. The overall objective is to define the problems inherent in this procedure for the renovation of cooling tower blowdown and to determine the best operating conditions and methods of process control. These data should also contribute toward an evaluation of the feasibility and cost of this procedure, and facilitate the later operation of the proposed mobile test and demonstration facility.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 803336

TITLE OF PROJECT: Beneficial Disposal of Water Purification Plant Sludges in Wastewater Treatment

GRANTEE OR CONTRACTOR:

NMCWD
P. O. Box 146
Novato, California 94947

EPA PROJECT OFFICER:

Mr. G. Nelson
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Northern Marin County, California

DESCRIPTION OF PROJECT

Award Date: August, 1974

Project Cost:

Completion Date: August, 1975

Federal Cost: $39,800

Summary:

1. Objective - To study the effects of discharging alum sludge from a water filtration plant to an operating activated sludge plant.

2. Approach - The operation of the wastewater treatment plant would be observed, monitored, and recorded under normal conditions as a baseline, and subsequently under addition of alum sludge wastes from a water purification plant.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: Contract 68-03-0233

TITLE OF PROJECT: A Technical and Economic Evaluation of Blowdown Control Techniques

GRANTEE OR CONTRACTOR:

WAPORA, Inc.
6900 Wisconsin Avenue, N. W.
Washington, D. C. 20015

EPA PROJECT OFFICER:

Mr. G. R. Nelson
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Washington, D. C.

DESCRIPTION OF PROJECT

Award Date: March, 1973

Completion Date: August, 1973

Project Cost: $21,453

Federal Cost: $21,453

Summary:

The objectives were:

a. The objective of this report was to detail the techniques associated with the control of blowdown from cooling devices (particularly cooling towers) which have a circulation rate of 500 ft^3/sec or greater. The cooling devices emphasized were those which had been on-line for five years or less, or were on the drawing boards for the future.

b. Information was presented in a manner which enabled representatives of regulatory agencies or industry to readily compare the technical aspects, economic considerations, and environmental implications of the various approaches to cooling water and waste water treatment.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: Contract 68-03-0430

TITLE OF PROJECT: Engineering and Economic Assessment of Backfitting Power Plants with Closed-Cycle Cooling Systems

GRANTEE OR CONTRACTOR:

The University of Iowa
Iowa City, Iowa 52242

EPA PROJECT OFFICER:

Mr. J. Chasse
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Iowa City, Iowa

DESCRIPTION OF PROJECT

Award Date: April, 1974

Completion Date: November, 1974

Project Cost: $32,000

Federal Cost: $32,000

Summary:

The proposed research would investigate the engineering and economic (including environmental) consequences of backfitting a steam-electric power plant (both fossil fueled and nuclear based) operating on an open-cycle cooling system with each of the following closed-cycle cooling systems; a) Mechanical draft evaporative towers, b) Natural draft evaporative towers, c) Cooling ponds and lakes, and d) Spray cooling ponds and canals. The purpose of this investigation is to quantify the comprehensive technical and economic information necessary to facilitate evaluation of cooling system modifications (from the open-cycle or once-through system). The major objective of the research is to determine and to present techniques for evaluating the engineering and economic implications of backfitting a power-plant unit and to provide estimates of the additional cost of power generation. The approach to be utilized would provide for economic evaluation through consideration of the components of the individual cooling systems, of consequent loss of production and of all relevant operating expenditures. The evaluation and design techniques are to be illustrated using information and quantitative data on specific power generating units which have been backfitted or are undergoing such modifications.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: Contract 68-03-2053

TITLE OF PROJECT: Engineering and Economic Assessment of Once-Through Cooling Systems Modifications for Adverse Impact Control

GRANTEE OR CONTRACTOR:

Acres American Incorporated
Liberty Bank Building, 9th Floor
Main at Court
Buffalo, New York 14202

Project Site: Buffalo, New York

EPA PROJECT OFFICER:

Mr. J. Chasse
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

DESCRIPTION OF PROJECT

Award Date: July, 1974

Completion Date: April, 1975

Project Cost: $58,800

Federal Cost: $58,800

Summary:

A methodology is to be developed for evaluating the engineering and economic implications of modifying the once-through cooling water discharge systems of thermal-electric generating plants for adverse impact control. The study includes investigation of modifying existing surface and subsurface discharge systems and an identification and description of operational characteristics and specific engineering and cost data important to system selection. - The study is to be conducted thus: a) Through a literature survey and personal communications with the appropriate expertise, a bibliography of cost and engineering data for generating plants will be developed, b) Resolution of the data into viable alternatives representing "typical" situations categorized by the type of discharge system (surface or submerged), the nature of the receiving water, bathymetry and plant size, c) Relating engineering and cost implications to the probability of meeting effluent limitations promulgated by EPA under PL 92-500, and d) Develop the methodology with which costs (Capital and Operational) can be estimated based on plant and site information and the applicable effluent standards.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

FINAL REPORTS AVAILABLE

THERMAL POLLUTION

REPORT NUMBER	TITLE/AUTHOR	SOURCE
16130 09/68	Industrial Waste Guide on Thermal Pollution, by Pacific Northwest Water Lab., FWPCA, Corvallis, Oregon	NTIS/PB 197 262
16130 12/68	Experimental Study of Warm Water Flow Into Impoundments - Part I Part II; Part III; by St. Anthony Falls Hydraulic Lab., University of Minnesota, Minneapolis, Mn.	NTIS/PB 188 512 NTIS/PB 188 513 NTIS/PB 188 514
16130 09/69	Working Paper No. 67: Economic Aspects of Thermal Pollution Control in the Electric Power Industry, by A. G. Christianson and B. A. Tichenor, Pacific Northwest Water Lab., FWPCA, Corvallis, Oregon	NTIS/PB 208 434
16130 04/70	Guidelines: Biological Survey at Proposed Heat Discharge Sites, by R. R. Garton, Pacific Northwest Water Lab., FWQA, Corvallis, Oregon and R. D. Harkins, Robert S. Kerr Water Research Center, FWQA, Ada, Oklahoma	GPO - $1.00 NTIS/PB 206 815
16130 10/70	Thermoelectric Generators Powered by Thermal Waste From Electric Power Plants; by M. A. Shirazi, Pacific Northwest Water Lab., FWQA, Corvallis, Oregon	GPO - $0.45 NTIS/PB 207 870
16130 DFX 05/70	An Engineering-Economic Study of Cooling Pond Performance, by Littleton Research and Engr., Littleton, MA.	GPO - $1.50 NTIS/PB 206 817
16130 DHS 07/69	A Survey of Alternate Methods for Cooling Condenser Discharge Water - Large Scale Heat Rejection Equipment, by Dynatech R/D Company, Cambridge, MA.	GPO - $1.25 NTIS/PB 208 036
16130 DHS 08/70	A Survey of Alternate Methods for Cooling Condenser Discharge Water - Operating Characteristics and Design Criteria, by Dynatech R/D Company, Cambridge, MA.	GPO - $1.00 NTIS/PB 208 035
16130 DHS 11/70	A Survey of Alternate Methods for Cooling Condenser Discharge Water - Total Community Considerations in the Utilization of Rejected Heat, by Dynatech R/D Company, Cambridge, MA.	GPO - $0.65 NTIS/PB 206 816

REPORT NUMBER	TITLE/AUTHOR	SOURCE
16130 DHS 01/71	A Survey of Alternate Methods for Cooling Condenser Discharge Water - System Selection, Design and Optimization, by Dynatech R/D Company, Cambridge, MA.	GPO - $1.00 NTIS/PB 212 392
16130 DJH 01/71	A Predictive Model for Thermal Stratification and Water Quality in Reservoirs, by Massachusetts Institute of Technology Cambridge, MA.	GPO - $2.00 NTIS/PB 211 621
16130 DJH 04/71	Temperature Prediction in Stratified Water: Mathematical Model - User's Manual, by Ralph M. Parsons Lab., Massachusetts Institute of Technology, Cambridge, MA.	GPO - $1.25 NTIS/PB 210 701
16130 DJU 02/71	An Analytical and Experimental Investigation of Surface Discharge of Heated Water, by Massachusetts Institute of Technology, Cambridge, MA.	GPO - $1.75 NTIS/PB 210 134
16130 DNE 03/71	Advanced Nonthermally Polluting Gas Turbines in Utility Application, by United Aircraft Corp., East Hartford, CT.	GPO - $2.00 NTIS/PB 211 283
16130 DNH 01/71	Potential Environmental Modifications Produced by Large Evaporative Cooling Towers, by E G & G, Inc., Boulder, CO.	GPO - $0.75 NTIS/PB 210 702
16130 DPU 02/71	Research on the Physical Aspects of Thermal Pollution, by Cornell Aeronautical Lab., Inc., Buffalo, New York.	GPO - $1.75 NTIS/PB 210 124
16130 DWO 10/70	Mathematical Models for the Prediction of Temperature Distributions Resulting from the Discharge of Heated Water into Large Bodies of Water, by Tetra Tech. Inc., Pasadena, CA.	GPO - $1.75 NTIS/PB 208 034
16130 EES 11/70	Research on Dry-Type Cooling Towers for Thermal Electric Generation, Part I: Part II: by R. W. Beck & Associates, Denver, CO.	GPO - $2.50 NTIS/PB 206 954 GPO - $1.00 NTIS/PB 210 778
16130 ENT 12/69	Thermal Pollution: Status of the Art, by Vanderbilt University, Nashville, TN.	(Vanderbilt - $4)
16130 EXT 12/69	Mathematical Models for the Prediction of Thermal Energy Change in Impoundments, by Water Resources Engineers Inc., Walnut Creek, CA.	GPO - $1.50 NTIS/PB 210 126
16130 FDQ 03/71	Effect of Geographical Location on Cooling Pond Requirements and Performance, by Vanderbilt University, Nashville, TN.	GPO - $2.00 NTIS/PB 208 031

REPORT NUMBER	TITLE/AUTHOR	SOURCE
16130 FDQ 03/71	Heated Surface Jet Discharged into a Flowing Ambient Stream, by L. H. Motz and B. A. Benedict, Vanderbilt University, Nashville, TN.	GPO - $1.75 NTIS/PB 211 284
16130 FHJ 09/70	Beneficial Uses of Waste Heat - An Evaluation, by Northwest Water Research Lab., FWQA, Corvallis, Oregon	NTIS/PB 201 724
16130 FSU 12/71	Surface Discharge of Heated Water, by H. Stefan, N. Hayakawa, and F. Schiebe, St. Anthony Falls Hydraulic Lab., Univ. of Minnesota, Minneapolis, MN.	GPO - $2.00 NTIS/PB 211 285
16130 GFI 06/71	Potential Environmental Effects of an Offshore Submerged Nuclear Power Plant, Vol. I:	GPO - $2.50 NTIS/PB 208 281
	Vol. II: by General Dynamics, Electric Boat Div., Groton, CT.	GPO - $2.25 NTIS/PB 208 282
16130 GKF 12/70	A Method for Predicting the Performance of Natural Draft Cooling Towers, by Pacific Northwest Water Lab., EPA, Corvallis, Oregon	GPO - $0.75 NTIS/PB 210 125
16130 GNK 10/71	Development and Demonstration of Low-Level Drift Instrumentation, by Environmental Systems Corp., Knoxville, TN.	GPO - $0.65 NTIS/PB 210 759
EPA-R2-72-074a (16130 ERN)	A Procedure and Case Study Demonstration for Evaluating the Cost of Thermal Effluent Control for Proposed Steam-Electric Generating Units (Final Report), by F. A. Smith and L. Ortolano, The Center for the Environment and Man, Inc., Hartford, Ct.	NTIS/PB 214 207
EPA-R2-72-074b (16130 ERN)	A Procedure for Estimating Costs of Thermal Effluent Modifications for Existing Steam-Electric Generating Stations (Study Paper No. 2), by L. Ortolano and F. A. Smith, The Center for the Environment and Man, Inc. Hartford, CT.	NTIS/PB 214 123
EPA-R2-72-083 (16130 FOK)	Controlling Thermal Pollution in Small Streams, by G. W. Brown and J. R. Brazier, Oregon State Univ., Corvallis, Oregon	GPO - $1.25 EP 1.23/2:72-083 NTIS/PB 213 901
EPA-R2-73-259 (16130 DIP)	Heat and Water Vapor Exchange Between Water Surface and Atmosphere, by W. H. Brutsaert, Cornell Univ., Ithaca, NY	GPO - $0.90 EP 1.23/2:73-259

REPORT NUMBER	TITLE/AUTHOR	SOURCE
EPA-R2-73-273 (16130)	Predicting and Controlling Residual Chlorine in Cooling Tower Blowdown, by G. R. Nelson, PNW Environmental Research Lab., EPA, NERC, Corvallis, Oregon	(Pending)
EPA-R2-73-161 (16130 FLM)	Analysis of Engineering Alternatives for Environmental Protection from Thermal Discharges, by State of Washington Water Research Center, Univ. of Washington/Washington State Univ., Pullman, WA.	GPO - $2.60 EP 1.23/2:73-161 NTIS/PB 221 498
EPA-R2-73-162 (16130 DGM)	Numerical Thermal Plume Model for Vertical Outfalls in Shallow Waters, by D. S. Trent, and J. R. Welty, Oregon State Univ., Corvallis, Oregon	GPO - $4.80 EP 1.23/2:73-162 NTIS/PB 221 488
EPA-R2-72-005a (16130 FHH)	Pending	
EPA-660/2-74-011 (16130 EIK)	A Demonstration of Thermal Water Utilization in Agriculture, by Eugene Water and Electric Board	GPO - $2.80
EPA-660/2-73-004 (16130 HKK)	Nomographs for Thermal Pollution Control Systems by Hittman Associates	GPO - $1.80
16130 GSD	Study for the Stochastic Calculation of Water Equilibrium Temperature by Environmental Systems Laboratory	
16130 GNK EPA-660/2-73-011	Explicit Calibration of the PILLS II System, by the Environmental Systems Corp.	GPO - $0.65
16130 EMQ	Turbulent Bed Cooling Towers, by Purdue Research Foundation	

WOOD PULPING, PAPER AND PAPERBOARD MANUFACTURING, AND LUMBER AND WOOD PRODUCTS

The all-inclusive title "Forest Products" would certainly encompass the industrial program area addressed here, but that title would not be sufficiently definitive. The more lengthy title is preferred since it categorizes three broad areas in which wood is the basic ingredient for the manufacture or production of a vast array of consumables.

The two major industry groups of concern are identified in the Standard Industrial Classification Manual (SIC). Under Major Group 26, "Paper and Allied Products," and under Major Group 24, "Lumber and Wood Products, Except Furniture," are various sub-categories. The program area herein defined in relation to them is one in technology research (TR) intended to provide an economically viable technology to satisfy point source effluent discharge standards addressed to various sub-categories of these two major groups of industries.

Sub-categories within SIC Group 26 include pulp mills whose primary activity is the making of pulp from wood or other material such as rags, linters, waste paper, and straw. Paper mills primarily engaged in the manufacture of paper from wood pulp and other fibers as well as integrated mills (those who manufacture pulp and paper) are included. Also included are establishments primarily engaged in manufacturing paperboard from wood pulp and other fibers. Building paper and building board mills using wood pulp and other fibrous pulps are also included.

Within the SIC Group 24, sub-categories which this program is addressed to are mills primarily engaged in plywood, veneer and laminated wood production, as well as particleboard producers and wood preserving establishments.

For the pulp and paper making industries it has been estimated that the total waste load developed from their processes represents 27 percent of the total pollutional load attributed to all manufacturing. Wastes from these industries may show extreme pH variations; extremely high biochemical oxygen demand loads (dependent on the pulping process); high color due to lignin compounds released in pulping and bleaching as well as loss of pigments and dyes in paper making; and may have a toxic effect on aquatic life at various levels of the food chain. In addition these wastes can contain significant amounts of settleable and suspended solids in the form of fiber, dirt, and debris.

Environmental problems generated by the lumber and wood production include water quality degradation due to log rafting, transport, and log pond operations. The leaching of soluble materials and the accumulation of color and bark debris follows.

Lumber production creates wastes resulting in both air and water pollution, however in large mill operations, chips and sawdust residue can be used as feed for pulp, hardboard, chipboard, and insulation board manufacture. Plywood mills, wet process hardboard, and insulation board mills contribute water carried wastes containing water soluble wood extractives, urea-formaldehyde and phenolic glue residues, fire retardants, pesticides, and wood fiber as the product may require. Wood preservation utilizes a number of heavy metals, pentachlorophenol, creosote, and oil in processing lumber, poles and piling. Water carried wastes are derived from these operations.

The R&D program for the above industry areas initiates research efforts under the grant, contract, and in-house provisions of PL 92-500, Section 104 and 105. Objectives are to develop and demonstrate technology which will result in the elimination of the discharge of pollutants.

The objectives are met through a R&D planning function located at EPA Headquarters, Washington, D. C., and an implementation program located at the Pacific Northwest Environmental Research Laboratory at Corvallis, Oregon.

PROJECT INDEX

PULP, PAPER, PAPERBOARD, LUMBER AND WOOD PRODUCTS INDUSTRIES

	Grantee or Contractor	Project Status
DBD	Montana State University	A
DEH	University of Washington	A
DKD	Institute of Paper Chemistry	A
DLQ	Oregon State University	A
DRY	Continental Can Company, Inc.	A
DYD	Interstate Paper Corporation	A
EBG	Oregon State University	A
EBY	Oregon State University	A
EEK	Georgia Kraft Company	A
EEL	Pulp Manufacturers Research League	A
EFC	University of Washington	A
EJU	St. Regis Paper Company	A
ELW	Crown Zellerbach Corporation	A
EMY	The Mead Corporation	A
ENC	International Paper Company	A
ESV	Crown Zellerbach Corporation	A
EUG	Georgia Kraft Company	A
EXQ	University of Washington	A
EZU	Klamath Plywood Corporation	A
EZZ	University of North Carolina	A
FDE	Esleeck Manufacturing Company and Strathmore Paper Company	B
FES	S. D. Warren Company	A

	Grantee or Contractor	Project Status
FKS	Weyerhaeuser Company	C
FUB	Green Bay Packaging, Inc.	A
GLV	WAPORA, Inc.	A
GQD	Crown Zellerbach Corporation	A
HAR	WAPORA, Inc.	A
HDU	Georgia - Pacific Corporation	A
HIG	Koppers Company, Inc.	B
HPK	University of Washington	B
14-12-162	Electro-Optical Systems, Inc.	C
800261	Champion Paper Division, U. S. Plywood Corp.	A
800520	Green Bay Packaging Company	B
800740	The Chesapeake Corporation of Virginia	B
800853	Institute of Paper Chemistry	A
801202	Garrett Research and Development Corp.	B
801206	Big Chief Roofing Company	B
801876	University of Arkansas	A
801207	Institute of Paper Chemistry	A
803119	Institute of Paper Chemistry	B
803270	St. Regis Paper Company	B
803302	Flambeau Paper Company	B
803347	National Council for Stream and Air Improvement	B
803348	National Council for Air and Stream Improvement	B

Project Status:

A - Completed, Final Report Available
B - Project Ongoing
C - Project Discontinued

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (Pl. 92-500)

PROJECT NUMBER: DBD

TITLE OF PROJECT: Ion Exchange Color and Mineral Removal from Kraft Bleach Wastes

GRANTEE OR CONTRACTOR:

Department of Civil Engineering
and Engineering Mechanics
Montana State University
Bozeman, Montana 59715

EPA PROJECT OFFICER:

Dr. H. K. Willard
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Bozeman, Montana

DESCRIPTION OF PROJECT

Award Date: June 1971

Project Cost: $110,000

Completion Date: May 1973

Federal Cost: $91,300

Summary:

Laboratory evaluations of twenty resins and seven carbons for removing color and minerals from a four-stage kraft bleach plant showed resins were equal to carbon for decoloring the combined waste. With few exceptions, resins were unsuited for decoloring wastes from each stage separately. Except for success in the use of weak wash to regenerate Amberlite XAD-8 resin, utilization of mill liquors for regeneration was unsuccessful. Sulfuric acid, caustic, and ammonia were good regenerants, but lime was poor. - Single stage ion exchange and two-stage desalination produced water adequate for unbleached and bleached pulping respectively. Any of the continuous counter-current ion exchange processes are probably adequate for producing water for bleached pulping. - The estimated cost for desalination including amortization over a 10 year period at 9% interest, labor, chemicals, maintenance, and repairs are estimated to vary from $1.38/1000 gal (for the non-optimized process used in the laboratory) to $0.42/1000 gal (with estimated 90% cation regeneration efficiency, 85% anion regeneration efficiency, and 87% product recovery).

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

INFORMATION SHEET

ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DEH

TITLE OF PROJECT: Studies of Low Molecular Weight Lignin Sulfonates

GRANTEE OR CONTRACTOR:
Department of Chemical Engineering
University of Washington
Seattle, Washington 98105

EPA PROJECT OFFICER:
Dr. H. K. Willard
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Seattle, Washington

DESCRIPTION OF PROJECT

Award Date: September 1970

Project Cost: $32,049

Completion Date: October 1971

Federal Cost: $28,844

Summary:

Low molecular weight lignin sulfonates have been separated in purified form and characterized by physicochemical and chemical methods. Their structure and reactions have been evaluated.

Lignin sulfonates from the spent sulfite liquor of a mild acid bisulfite cook of Western Hemlock (Tsuga heterophylla) were purified and fractionated in Sephadex G-25 column chromatography. Samples were analyzed using acetylation of hydroxyl-groups and esterification of sulfonate-groups which aided the elimination of the polydisperse nature of the material under investigation.

Complete elemental and functional group compositions were established for lignin sulfonates from a spent sulfite liquor and compared to those from milled wood lignin preparation. This allowed an estimate of the degree of sulfonation, condensation and demethylation as well.

The feasibility of large scale separations was determined using 1) the extraction and precipitation of the dry matter in a spent sulfite liquor with alcohol, and 2) the fractionation of the material by ion exclusion in a column arrangement.

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the
Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DKD

TITLE OF PROJECT: Kraft Effluent Color Characterization Before and After Stoichiometric Lime Treatment

GRANTEE OR CONTRACTOR:

The Institute of Paper Chemistry
Appleton, Wisconsin

EPA PROJECT OFFICER:

Mr. George Webster
Industrial Pollution Control
Division (RD-679), EPA
Washington, D. C. 20460

Project Site: Appleton, Wisconsin

DESCRIPTION OF PROJECT

Award Date: December 1968

Project Cost: $170,721

Completion Date: February 1973

Federal Cost: $119,505

Summary:

The lime-treatment process was found to remove on an average about 86% of the color, 57% of the total organic carbon, and 17% of total sugars from the waste effluent during the period of approximately 15 months over which the samples were collected. No appreciable change in chloride content was noticed. - The "weight average" molecular weights (M_w) of the untreated acid-insoluble fractions varied from $<$400 to 30,000 and of the untreated acid-soluble, lime-treated acid-insoluble, and lime-treated acid-soluble fractions from 400 to 5000. - The study shows that color bodies having an apparent M_w of 400 are not removed by lime treatment and those having M_w of 5000 and above are completely removed. The intermediate range of M_w 400 to 5000 apparently undergoes partial removal. - The color bodies which are not removed by lime treatment have low M_w, high nonconjugated carboxyl groups, some lignin like character, and seem to be associated with colorless carbon compounds.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DLQ

TITLE OF PROJECT: Slime Growth Evaluation of Treated Pulp Mill Wastes

GRANTEE OR CONTRACTOR:

Department of Microbiology
Oregon State University
Corvallis, Oregon 97331

EPA PROJECT OFFICER:

Mr. Donald May
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Corvallis, Oregon

DESCRIPTION OF PROJECT

Award Date: May 1969

Project Cost: $31,259

Completion Date: August 1971

Federal Cost: $28,325

Summary:

The main objectives were to evaluate the slime growth potential of pulp mill wastes treated by various methods of biodegradation. Wastes were tested both before and after secondary treatment in order to determine the type of biodegradable material present in the influent, determine the extent of fermentation during treatment, and the amount of biodegraded fermentables discharged in the effluent. The intent was to define total carbon, readily fermentable carbon, and to design a reasonably accurate and sensitive method for predicting adequate water quality presently measured by BOD. - Gas chromatographic analysis of monosaccharides, total carbon, and continuous culture proved to be effective analytical procedures. These techniques showed that Sphaerotilus natans would grow in treated effluent, that residual sugars in the treated effluent could be detected easily by GC, that total solids and sugar concentrations parallel influent flow rate, that during influent surges, effluent sugar concentrations are high enough to support slime growth, that weekly variations were evident, and that differences between the two treatment ponds could be observed.

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DRY

TITLE OF PROJECT: Color Removal and Sludge Disposal Process for Kraft Mill Effluents

GRANTEE OR CONTRACTOR:

Continental Can Company, Inc.
Mill Operations Division
Hodge, Louisiana 71247

EPA PROJECT OFFICER:

Dr. H. K. Willard
PNERL, EPA
Corvallis, Oregon 97330

Project Site: Hodge, Louisiana

DESCRIPTION OF PROJECT

Award Date: July 1968

Project Cost: $2,865,970

Completion Date: February 1973

Federal Cost: $750,000

Summary:

A treatment plant, removing color by lime addition and recovering sludges, treated over 80% of the effluent of an unbleached kraft mill for one year. Using up to 1,100 mg/l of CaO, with normal mill fiber loss as a precipitation aid, average color reduction was 80% for all-kraft effluent. At upper range of lime dosage, when residual dissolved Ca was above 400 mg/l as CaO, color removal was 85-93%. When mill production included 33-40% NSSC hardwood pulp, color reduction averaged only 65%. - About 12% BOD_5 reduction was observed, and average TOC reduction was nearly 40%. The chief negative factor is need for emergency protection against alkaline impact on secondary treatment and receiving stream. - Following centrifuge dewatering, sludge incineration had minimal impact on kiln operation; there were some adverse effects on lime quality. Lime recovery was 93%. - Primary clarification and sludge disposal are included in the process. Operating costs, exclusive of capital factors, are estimated at $0.50-$0.80 per ton of paper, or 5.5¢ to 6.5¢ per thousand gallons, depending on fiber losses and water usage.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: DYD

TITLE OF PROJECT: Evaluation and Demonstration of the Massive Lime Process for the Removal of Color from Kraft Pulp Mill Wastes

GRANTEE OR CONTRACTOR:

International Paper Company
220 East 42nd Street
New York, New York 10017

EPA PROJECT OFFICER:

Mr. George Putnicki
Region VI, EPA
1402 Elm Street
Dallas, Texas 75202

Project Site: Springhill, Louisana 71075

DESCRIPTION OF PROJECT

Award Date: June 1968

Project Cost: $850,000

Completion Date: December 1972

Federal Cost: $595,000

Summary:

A demonstration plant was installed and operated to determine effectiveness and feasibility of using massive lime treatment (that is, 20,000 ppm lime) to decolor kraft pulp mill effluents. The two most highly colored effluents and mixtures of these treated in the demonstration plant were: 1) The almost black effluent from the caustic extraction stage of pulp bleaching, and 2) The light reddish-brown effluent from the final unbleached pulp washing stage. Objectives of the project were to determine: Effectiveness of color removal, design, and performance of massive lime system equipment, effects on normal pulp mill operations, effects on pulp quality, operating costs. Impact of the massive lime system on a hypothetical 1000 tons-per-day bleached kraft pulp and paper mill is described. Using all the lime normally available in such a mill would allow massive lime treatment of four million of the mill's twenty-nine million gallons of effluent. Such treatment would remove 72% of the total mill effluent's color, reducing final effluent color to approximately 740 APHA units at an estimated operating cost of $1.80 per ton of pulp (depreciation, insurance, and taxes included).

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EBG

TITLE OF PROJECT: The Influence of Log Handling on Water Quality

GRANTEE OR CONTRACTOR:

Oregon State University
Corvallis, Oregon 97331

EPA PROJECT OFFICER:

Dr. H. K. Willard
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Corvallis, Oregon

DESCRIPTION OF PROJECT

Award Date: June 1970

Project Cost: $21,740

Completion Date: February 1973

Federal Cost: $20,633

Summary:

The objective was to determine the effect of log storage on water quality. Soluble organic matter and some inorganics leach from logs floating in water and from logs held in sprinkled land decks. The character and quantity of leachate from Doublas fir, ponderosa pine, and hemlock logs were examined. Measurements including BOD, COD, PBI, solids, and toxicity (no kill to 20% TLm 96) have shown that in most situations the contribution of soluble leachates to holding water is not a significant water pollution problem. - The most significant problem associated with water storage appears to be the loss of bark from logs during dumping, raft transport and raft storage. Dislodged bark can float until it becomes water logged and sinks, forming benthic deposits. Floating bark is aesthetically displeasing and could interfere with other beneficial uses of a lake, stream or estuary. Benthic deposits exert a small, but measurable oxygen demand and may influence the biology of the benthic zone. Implementation of corrective measures by the timber industry to reduce bark losses could make the water storage of logs a practice which is compatible with a high quality environment.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EBY

TITLE OF PROJECT: Aerial Photographic Tracing of Pulp Mill Effluent in Marine Waters

GRANTEE OR CONTRACTOR:

Department of Civil Engineering
Oregon State University
Corvallis, Oregon 97331

EPA PROJECT OFFICER:

Mr. Ralph Scott
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Newport and Gardiner, Oregon
Samoa, California

DESCRIPTION OF PROJECT

Award Date: June 1969

Project Cost: $20,781

Completion Date: August 1970

Federal Cost: $19,237

Summary:

Aerial photography taken of waste plumes from Kraft pulp mill ocean outfalls was shown to be an effective tool in the study of waste disposal sites. Photography taken at one instant provides comprehensive information throughout the waste field. Manpower requirements and costs for this method are considerably less than for conventional boat sampling surveys. - Waste concentrations were measured by conventional boat sampling techniques while aerial photography was taken of the outfall area from altitudes ranging from 3,000 to 11,000 ft. Computerized procedures were used to compute water currents, waste concentrations, toxicity zones, and diffusion coefficients from the photography. - Surface water current was found to be the dominant factor in the resulting plume pattern. During periods of low current velocities in the receiving water, the hydraulic head created by the effluent source was a significant factor in the resulting plume shape. Temperature was found not to be an effective tracer for tracking the plume or for estimating waste concentrations since the resulting plume temperature may exceed, equal to, or be less than the surrounding ocean temperature.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EEK

TITLE OF PROJECT: Treatment of Selected Internal Kraft Mill Wastes in a Cooling Tower

GRANTEE OR CONTRACTOR:

Georgia-Kraft Co.
Rome, Georgia

EPA PROJECT OFFICER:

Mr. Ralph Scott
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Macon, Georgia

DESCRIPTION OF PROJECT

Award Date: October 1967

Project Cost: $411,000

Completion Date: August 1971

Federal Cost: $287,000

Summary:

Pulp mill condensates, decker filtrate, and turpentine decanter underflow from an 850 ton/day Kraft linerboard mill were successfully treated in a conventional cooling tower. These waste streams, in combination with the condenser waters from a barometric type evaporator condenser, were cooled in the tower and reused. The overall accomplishments of this process were the removal of about 10,000 lbs of BOD per day and the reduction in overall mill water needs of about 8-10 mgd. Theoretical, laboratory, and pilot studies investigated the BOD removal mechanisms involved and proved that the predominant mechanism is stripping of volatile components. The primary factors controlling BOD removal in this system are blowdown rate, liquid-gas ratio, and average temperature. For a blowdown rate of 15-20 percent of the tower influent, average treatment efficiencies for the waste streams considered are 55-65% for sixth effect condensate, 45-55% for combined condensate and turpentine decanter underflow, and 25-35 percent for decker filtrate. - The reduction in BOD of these waste streams is believed due primarily to the stripping of methanol. Some biological activity is evident in the tower, however, and the addition of nutrients results in an improvement of 5-10% in BOD removal. The system has several advantages over the conventional surface condenser system used with Kraft mill evaporators.

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EEL

TITLE OF PROJECT: Development of Reverse Osmosis for In-Plant Treatment of Dilute Pulping Industry Wastes

GRANTEE OR CONTRACTOR:

Pulp Manufacturers Research League
Appleton, Wisconsin

EPA PROJECT OFFICER:

Mr. Ralph Scott
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Appleton, Wisconsin

DESCRIPTION OF PROJECT

Award Date: August 1967

Completion Date: February 1972

Project Cost: $690,530

Federal Cost: $483,371

Summary:

Adaptation of reverse osmosis as a method of concentration for dilute effluents of pulping, bleaching, and paper manufacture was conducted in laboratory, pilot scale, and in large 50,000 gallon per day field demonstrations at pulp mills. Most dilute wastes at 1% solids contained suspended particles, colloidal suspensoids, large molecular-weight wood derived organics, and/or scale-forming inorganic chemical residues. Tubular membrane systems capable of being operated at self-cleaning velocities increasing beyond 2.0 feet per second, as concentration advanced to 10% solids, were apparently best adapted to processing these effluents at sustained high flux rates. Tubular systems studied were subject to excessive failure rates in terms of life of membrane support structures or to leakage of internal connections based on the support structure. Feasibility of employing RO for concentration of dilute pulping and bleaching effluents depends on developing routes to substantial improvement in life expectancy of RO equipment to maintain high flux rates and rejections at much lower membrane maintenance and replacement costs than prevailed with equipment available for these studies conducted from 1967 through 1971.

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EFC

TITLE OF PROJECT: Pollution Abatement by Fiber Modification

GRANTEE OR CONTRACTOR:
College of Forest Resources
University of Washington
Seattle, Washington 98105

EPA PROJECT OFFICER:
Mr. Ralph Scott
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Seattle, Washington

DESCRIPTION OF PROJECT

Award Date: June 1969

Completion Date: January 1971

Project Cost: $41,603

Federal Cost: $37,850

Summary:

Laboratory studies led to the discovery of two new methods for the collection of pollutants by fibers based on oxidative grafting. Further, physical entrapment by hydrodynamic volume changes were also discovered and a procedure for the characterization of copolymer compositions by surface tension was established. Cellulosic or lignocellulosic fibers can be reacted with di- or tri-halogeno-*s*-triazines in simple aqueous conditions so that about 10% of weight of reactive sites can be built into the fiber. The modified fibers can be regarded as polychloro-*s*-triazinylated fibers in which each *s*-triazine ring contains approximately one or two reactive chlorine atoms. Chloro-*s*-triazines are capable of reacting in aqueous solutions with amines, mercaptans and phenols, typical of those present in pulping wastes and bleach plant effluent. The efficiency of this system is increased as the size of the pollutant removed per reactive fiber size is increased. Methods to increase the size of lignosulfonates by condensation have been developed.

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This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EJU

TITLE OF PROJECT: Kraft Pulping Effluent Treatment and Reuse - State-of-the-Art Portion - Part I

GRANTEE OR CONTRACTOR:

St. Regis Paper Company
150 E. 42nd Street
New York, New York 10017

EPA PROJECT OFFICER:

Mr. George R. Webster
Industrial Pollution Control
Division (RD-679), EPA
Washington, D. C. 20460

Project Site: Jacksonville and Pensacola, Florida

DESCRIPTION OF PROJECT

Award Date: June 1969

Project Cost: $48,000*

Completion Date: February 1973 (Part I)

Federal Cost: $26,800*

Summary:

This report presents a survey of the literature and other sources on present practices and advanced methods of handling and treatment of pulp and paper mill effluents, with particular emphasis on the kraft process, and the use of activated carbon and lime treatment as advanced methods of treatment. The survey was made as a first step in a three part development program aimed at maximum water reuse in kraft pulp and paper mills based on effluent treatment using activated carbon.

The results of the survey include information on activated carbon and its applications in treatment of pulp and paper mill effluents as well as in treatment of municipal water supplies and effluents. Information is presented on lime treatment of kraft mill effluent and on other advanced treatment methods. It also covers the subjects of in-plant water reuse, effluent collection systems, solids removal, and biological oxidation.

*Approximate, pending apportionment of costs after completion of Parts II and III.

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This sheet briefly describes an R & D project Section 104 or 105 of the
Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: ELW

TITLE OF PROJECT: Aerated Lagoon Treatment of Sulfite Pulping Effluents

GRANTEE OR CONTRACTOR:

Crown Zellerbach Corporation
Camas, Washington

EPA PROJECT OFFICER:

Mr. Ralph Scott
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Lebanon, Oregon

DESCRIPTION OF PROJECT

Award Date: December 1967

Completion Date: August 1971

Project Cost: $802,000

Federal Cost: $503,739

Summary:

Secondary treatment of sulfite pulp and paper mill effluents in aerated stabilization basins was tested on a full-scale basis over a 17-month period of continuous operation. The secondary treatment plant consisted of two aeration basins. One basin was equipped with two 75-hp surface aerators and the other basin of equal volume was equipped with six 25-hp aeration units. Piping was designed to permit series and parallel operation of the two basins and provisions were made to recycle treated waste. The waste treated was a mixture of weak wash water from the pulp mill, evaporator condensate from the spent liquor recovery system, and paper machine white water. – Results showed that series operation was more efficient than parallel operation and that the 75-hp surface aerators were much more efficient mixing and aeration devices than the 25-hp units of equivalent capacity. An 80% BOD reduction in the combined secondary system was achieved at a BOD load of 3.53 lbs/1,000 cu ft of aeration capacity or 2.2 lbs/hp-hr. This was equivalent to a daily BOD load of 16,000 lbs. Biological treatment of the mill waste to a BOD reduction of 80% to 85% produced a waste which did not readily support slime growth when added to simulated experimental streams. Total operating cost including interest on investment and depreciation was $169,500 per year or $4.79/ton of production.

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This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EMY

TITLE OF PROJECT: Multi-System Biological Treatment of Bleached Kraft Effluents

GRANTEE OR CONTRACTOR:

The Mead Corporation
Chillicothe, Ohio

EPA PROJECT OFFICER:

Mr. Ralph Scott
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Chillicothe, Ohio

DESCRIPTION OF PROJECT

Award Date: December 1966

Project Cost: $428,500

Completion Date: December 1970

Federal Cost: $299,950

Summary:

A multi-unit pilot plant was used to study the biological treatment of integrated Kraft pulp and paper wastewaters after conventional primary clarification. The biological units included two high-rate trickling filters packed with PVC media, an oxidation ditch with brush-type aeration, and an earthen lagoon with mechanical surface aeration. Because the main feed could be excluded from one or more biological units and, in its place, any of the pilot-unit effluents, except the aerated lagoon, could be pumped back to the main weir box for feed, simultaneous series and parallel operation of the four biological systems was possible. The combinations using normal strength wastewater included: (a) Trickling filters in series, (b) Trickling filter to aerated lagoon, (c) Oxidation ditch to aerated lagoon, and (d) Oxidation ditch to trickling filter.

– Best efficiencies at normal effluent strength were obtained on the pilot oxidation ditch when run with clarification and sludge return as the extended aeration process. BOD_5 removals as high as 94% were possible. The trickling filter with sludge recycle performed slightly better than the conventional trickling filter. BOD_5 removals of 60% to 70% were possible. The conventional aerated lagoon at short detention times was improved by clarification of the treated effluent. BOD_5 removals of 80% were possible.

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: ENC

TITLE OF PROJECT: Color Removal from Kraft Pulping Effluent by Lime Addition

GRANTEE OR CONTRACTOR:

Interstate Paper Corporation
300 East 42nd Street
New York, New York 10017

EPA PROJECT OFFICER:

Mr. Edmond Lomasney
Region IV, EPA
1421 Peachtree Street, N.E.
Atlanta, Georgia 30309

Project Site: Riceboro, Georgia

DESCRIPTION OF PROJECT

Award Date: June 1968

Project Cost: $741,160

Completion Date: December 1972

Federal Cost: $466,895

Summary:

A prototype color removal system was designed, constructed and operated as an integral part of a tertiary treatment system for total process effluent from a kraft linerboard mill. The basic system included a lime precipitation process for the removal of color combined with primary clarification followed by natural biochemical lake stabilization and mechanical aeration.

Results show that the color removal system can operate successfully under widely varying conditions to give a relatively constant effluent color in the range of 125 ppm APHA color units at treatment levels of 1000 (± 50) ppm of calcium hydroxide with untreated effluent colors in the range of 1200 (± 200) ppm. Treatment at this level reduces lime cost to $53.73 per million gallons with lime at $15.35/ton (90% CaO). Performance is directly related to control of lime feed. Equipment evaluation indicates substantial savings in capital cost for future installations.

Overall BOD$_5$ reduction for the tertiary treatment system is 98% with a final discharge average BOD$_5$ of 6 ppm.

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: ESV

TITLE OF PROJECT: Methods for Pulp and Paper Mill Sludge Utilization and Disposal

GRANTEE OR CONTRACTOR:

Crown Zellerbach Corporation
Environmental Services Division
Camas, Washington

Project Site: Camas, Washington

EPA PROJECT OFFICER:

Mr. Ralph Scott
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

DESCRIPTION OF PROJECT

Award Date: April 1968

Project Cost: $848,320

Completion Date: May 1973

Federal Cost: $350,000

Summary:

The disposal of pulp and paper mill sludge in a manner which has minimal effect on the environment has become a serious problem. This project was carried out to evaluate four methods of disposal, namely: (1) Incineration in an air entrained dryer-incinerator, (2) burning in hog fuel boilers, (3) incorporation into soil as an amendment, and (4) hydromulching for soil stabilization. Other possible uses are discussed. Burning sludge in incinerators costs between $11 and $13/dry ton, including all prior dewatering steps. Sludge can be made available at various degrees of dewatering at costs of from $7 to $20/dry ton. Incorporation into farm soil offers the possiblity for disposal of large quantities of sludge. At low levels (100-200 tons/acre) crop yields are satisfactory, provided adequate nitrogen is added. A high level incorporation (600 tons/acre) requires a year of fallow preceding crop planting. Sludge alone or in combination with bark can be used as a hydromulch in establishing grass stands on steep embankments.

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EUG

TITLE OF PROJECT: Foam Separation of Kraft Pulping Wastes

GRANTEE OR CONTRACTOR:

Georgia-Kraft Co.
Rome, Georgia

EPA PROJECT OFFICER:

Mr. Ralph Scott
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Rome, Georgia

DESCRIPTION OF PROJECT

Award Date: August 1967

Project Cost: $68,830

Completion Date: October 1969

Federal Cost: $48,181

Summary:

Laboratory studies of foam separation were conducted to determine the feasibility of this process for reducing BOD, solids content, and foaming tendency of clarified Kraft mill effluent. Since Kraft pulping wastes have a natural tendency to foam, it was expected that the foaming process, which has been found to be useful in treating domestic wastes, might have applications in treatment of these effluents. - Both continuous flow and batch experiments were conducted, and liquid and foam heights, liquid feed rates, air sparging rates, and temperature were varied over wide ranges. - The BOD reduction in the treated liquid was disappointingly small, averaging less than 5%, and the BOD enrichment in the foam phase was in most cases less than 1.5 times that of the feed. Solids removal was correspondingly low. - The cost of using a foam process on kraft mill wastes is estimated to be four to five cents per 1000 gallons of feed; this cost is exclusive of further processing of the concentrated foamate. Based on control of foaming tendency alone, the process would be unattractive from a cost standpoint.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EXQ

TITLE OF PROJECT: Steam Stripping Odorous Substances From Kraft Effluent Streams (SEKOR)

GRANTEE OR CONTRACTOR:

Department of Chemical Engineering
University of Washington
Seattle, Washington 98105

EPA PROJECT OFFICER:

Dr. H. K. Willard
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Seattle, Washington

DESCRIPTION OF PROJECT

Award Date: September 1970

Project Cost: $32,100

Completion Date: April 1973

Federal Cost: $28,899

Summary:

Laboratory and design studies have been completed relating to volatile constituents which appear in Kraft black liquor and condensate streams, and how these can best be removed and recovered. In order of decreasing concentration, the volatile constituents are alcohols, terpenes, ketones, sulfur bearing compounds, and phenolic compounds. Methanol, the major alcohol contaminant, is found in from 280 to 8400 ppm in condensate streams, amounting to 11 to 16 pounds per ton of pulp produced. Terpenes are found to range from a few ppm to about 4500 ppm in condensates, 4 to 9 pounds per ton of pulp. Acetone is present at concentrations of 2 to 200 ppm, corresponding to 0.07 to 0.4 pounds per ton of pulp. In all, some 40 compounds were found to be present in condensate streams. The feasibility of combining steam stripping of Kraft liquor with steam stripping of condensates was explored, and the conditions under which this may be warranted are reported. Under most present mill situations, steam stripping of black liquor and the last stages of evaporator condensates does not appear to be warranted except in unusual cases. Exploratory type studies were made and are reported concerning improved methods of predicting vapor-liquid equilibria in such systems, and separation of the resulting volatile oils.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EZU

TITLE OF PROJECT: Aerobic Secondary Treatment of Plywood Glue Wastes

GRANTEE OR CONTRACTOR:

Klamath Plywood Corp.
Klamath Falls, Oregon 97601

EPA PROJECT OFFICER:

Dr. H. K. Willard
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Klamath Falls, Oregon

DESCRIPTION OF PROJECT

Award Date: April 1968

Project Cost: $65,040

Completion Date: April 1973

Federal Cost: $42,028

Summary:

An activated sludge treatment system, consisting of an aeration tank, a tube-settler clarification module and a waste solids lagoon, was constructed at Klamath Plywood Corporation to treat urea-formaldehyde glue and steam vat condensate wastewater. The system was studied over a period of 18 months. Prior to operation the flow to the treatment system was reduced from about 40,000 gallons per day to about 8,000 gallons per day and BOD from 500-1,000 pounds per day to 100-400 pounds per day. During the period of greatest efficiency, the flow averaged 6,700 gallons per day and the BOD averaged 182 pounds per day. The results indicate that activated sludge treatment of urea-formaldehyde glue waste alone is not feasible. The combined wastewater is amenable to treatment by activated sludge, but requires the addition of phosphorus. Without nutrient addition, the average BOD removal was 38%. During the period when phosphorus was added to the system, the BOD removal averaged 78%. The flow averaged 9,800 gallons per day during the latter period. Treatment efficiency was adversely affected by cold weather during part of the study period.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: EZZ

TITLE OF PROJECT: Dilute Spent Kraft Liquor Filtration Through Wood Chips

GRANTEE OR CONTRACTOR:

School of Forest Resources
University of North Carolina
Raleigh, North Carolina

EPA PROJECT OFFICER:

Mr. Ralph Scott
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Raleigh, North Carolina

DESCRIPTION OF PROJECT

Award Date: August 1967

Project Cost: $25,920

Completion Date: April 1970

Federal Cost: $18,144

Summary:

The principal objective of this project was to determine if contact between effluent from a Kraft pulp mill and pine chips would reduce the water pollution characteristics of the waste liquor. - The experimental work was divided into two phases: 1) a small scale laboratory investigation of contacting dilute waste liquor with chips; and 2) a pilot-scale investigation of filtering waste liquor through a column and a pile of chips. - It was found that contact of alkaline waste liquor, or even distilled water, with pine chips extracted organic matter from the chips which had a considerable BOD_5. This extract corresponded to a pollution load of about 3-11 lbs. BOD_5 per ton of dry wood. Alkalinity, pH, and intensity of color of the waste liquor were somewhat reduced by the contact. These reductions are, however, too small to have any practical application in effluent treatment. It can, in general, be concluded that contact of alkaline waste liquor, or water, with wood chips extracts soluble organics and adds pollutional materials to the effluent stream.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: FDE

TITLE OF PROJECT: Treatment Plant for Flocculation and Microscreening of Whitewater

GRANTEE OR CONTRACTOR:

Esleeck Manufacturing Company
and Strathmore Paper Company
Turner Falls, Massachusetts

EPA PROJECT OFFICER:

Mr. Edward J. Conley
Region I, EPA
John F. Kennedy Federal Building
Boston, Massachusetts 02203

Project Site: Turners Falls, Massachusetts

DESCRIPTION OF PROJECT

Award Date: June 1970

Project Cost: $605,400

Completion Date:

Federal Cost: $252,345

Summary:

The objective of this grant is to investigate the applicability of microscreening of paper mill wastes from two paper mills that manufacture business, technical, and other papers made from either rag or chemical wood pulps to determine the removal of biochemical oxygen demand (BOD), suspended solids, color, and turbidity. Tests will be run utilizing a coagulant or coagulant aid, such as a polyelectrolyte, for the further removal of turbidity from the mocroscreener effluent. Evaluations to determine the possibility of reclaiming fibers from the microscreener sludge will be done. Appropriate treatment processes, such as centrifugation or sedimentation, may enable the mills to economically recover lost fibers.

Data will be obtained to determine design factors and estimates of the cost of construction and operation of such a facility. The cost of operation will be correlated with the retail market value of the product. Also, the study will conduct tests on a ultra-filter supplied free of charge by the EPA.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: FES

TITLE OF PROJECT: Sludge Disposal and Material Recovery System for Manufacturers of Coated and/or Filled Papers

GRANTEE OR CONTRACTOR:

S. D. Warren Co.
89 Cumberland Street
Westbrook, Maine 04092

EPA PROJECT OFFICER:

Dr. Hend Gorchev
Region I, EPA
John F. Kennedy Federal Building
Boston, Massachusetts 02203

Project Site: Westbrook, Maine

DESCRIPTION OF PROJECT

Award Date: May 1970

Project Cost: $65,875

Completion Date: July 1971

Federal Cost: $45,058

Summary:

A process was developed and tested in a full-scale trial wherein the pigment present in waste sludge was reclaimed. Sludge resulting from the primary treatment of white waters was diluted to less than 0.75% solids, centricleaned, dewatered to 30% solids, shredded, dried, and burned in a rotary kiln. The ash that resulted - the pigment - was then pulverized and used as filler pigment in the papermaking process.

A pigment of acceptable abrasiveness and a GE brightness of 84%-85% could be produced provided that the sludge was centricleaned and the temperature in the kiln kept below 1600°F.

A system capable of processing 40 dry tons per day primary treatment sludge would produce reusable filler pigment at a net cost of $50 per ton. Compared to the delivered cost of virgin filler clay ($38 per ton) it can be seen that full scale pigment recovery utilizing this sytem is not economically justifiable at this time.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: FKS

TITLE OF PROJECT: Steam Stripping and Rectification of Kraft Pulp Mill Condensates and Black Liquors

GRANTEE OR CONTRACTOR:

Weyerhaeuser Company
Longview, Washington 98632

EPA PROJECT OFFICER:

Dr. H. K. Willard
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Longview, Washington

DESCRIPTION OF PROJECT

Award Date: April 1970

Project Cost: $183,905

Completion Date: March 1972

Federal Cost: $128,733

Summary:

A pilot-plant stripping unit will be designed and built. This will be installed along with auxilliary equipment for rectification and storage. Runs will be made using decanter underflow, blow condensate, evaporator condensate, and black liquor. The stripping bottoms water will be tested and then sewered. The overhead, which forms two immiscible liquids when condensed, will be decanted, forming a crude turpentine product and a water soluble organic layer. This will be further rectified and processed to evaluate the worth of the products therein. The main objective is to determine on a large pilot-plant scale (50 gal/min. stripping unit) the efficiency and effectiveness of a steam stripping-rectification unit in reducing the volatile organic chemicals in Kraft process condensate streams. This reduction is directly proportional to the biochemical oxygen demand (BOD) reduction that can be achieved by this process. The mass transfer data provided by this stripping and rectification equipment, along with the economics of any by-products derived, is necessary for further decisions regarding full-scale units.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: FUB

TITLE OF PROJECT: Closure of Water Use Loop in NSSC Pulp and Paperboard Mill Utilizing R-O as a Unit Operation

GRANTEE OR CONTRACTOR:

Green Bay Packaging, Inc.
P. O. Box 1107
Green Bay, Wisconsin 54305

EPA PROJECT OFFICER:

Mr. Ralph Scott
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Green Bay, Wisconsin

DESCRIPTION OF PROJECT

Award Date: June 1970

Completion Date: January 1972

Project Cost: $42,830

Federal Cost: $17,665

Summary:

This project involved a pilot phase in which vendors operated proprietary equipment simultaneously and continuously on the same feed on a program in progress involving the closure of a pulp and paperboard mill. Recycle and reuse of weak waste waters containing dissolved organics was carried out to permit the development of operating techniques applicable to this particular feed.

Reverse osmosis was investigated as a unit operation, criteria determined for the design of a full-scale production facility, and equipment designs of the participating vendors were assessed.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: GLV

TITLE OF PROJECT: Delineation of Pulp and Paper Mill Wastes

GRANTEE OR CONTRACTOR:

WAPORA, Inc.
1725 DeSales Street, N.W.
Washington, D. C.

EPA PROJECT OFFICER:

Dr. Kirk Willard
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Washington, D. C.

DESCRIPTION OF PROJECT

Award Date: December 1970

Project Cost: $70,940

Completion Date: April 1973

Federal Cost: $70,940

Summary:

The results of this contractual effort set forth the state-of-the-art in the treatment of pulp and paper mill wastewater as it stands in 1971. In order to lay a background for the sections on treatment, a review of both the general economic position of the industry as a whole and the major production processes is included. Such a background is needed since a considerable degree of loss control is practiced within the processes and water recycling is an almost universal practice in this industry. Included also is a review of the water quality problems which the applied treatment processes are designed to rectify. Performance data for treatment processes and systems are presented together with a review of the applicability of common analytical methods to the measurement of waste characteristics and treatment effectiveness. The techniques used to monitor waste flowages for control purposes and as means of recording treatment efficiency are included. Finally, the remaining problems relative to control and treatment of pulp and paper mill spent process waters are pointed out. Research and development needs directed toward solving these problems are defined.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: GQD

TITLE OF PROJECT: Coliform Bacteria Growth and Control in Aerated Stabilization Basins

GRANTEE OR CONTRACTOR:

Crown Zellerbach Corporation
Environmental Services Division
Camas, Washington 98607

EPA PROJECT OFFICER:

Mr. Ralph Scott
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Lebanon, Oregon

DESCRIPTION OF PROJECT

Award Date: July 1971

Project Cost: $201,877

Completion Date: December 1973

Federal Cost: $95,568

Summary:

Secondary effluent from an ammonia base sulfite mill in Lebanon, Oregon, increased concentrations of coliforms (total coliform bacteria) in receiving waters to more than 1000 per 100 ml, the State standard. Factors responsible for high coliform populations were determined and a disinfection method was developed for reducing their numbers in secondary effluent. Chlorination was often ineffective. However, by injecting NaOH into the chlorinator's water supply, adequate coliform kill was achieved with approximately 5.7 ppm chlorine and 3.3 ppm NaOH. Continuous chlorination affected a reduction in coliforms in receiving waters to acceptable levels and the chlorinated effluent had a low degree of toxicity to salmonid fingerlings.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: HAR

TITLE OF PROJECT: Delineation of Paperboard, Building Paper, and Board Mill Industry Wastes

GRANTEE OR CONTRACTOR:

WAPORA, Inc
1725 DeSales St., N.W.
Washington, D. C.

EPA PROJECT OFFICER:

Dr. Kirk Willard
PNERL, EPA
200 S. W. 35th Street
Corvallis, Oregon 97330

Project Site: Washington, D. C.

DESCRIPTION OF PROJECT

Award Date: December 1970

Project Cost: $45,322

Completion Date: April 1973

Federal Cost: $45,322

Summary:

This report sets forth the state-of-the-art in the treatment of the industry wastes associated with the paperboard, building paper, and board mill industries. Included also is a review of the water quality problems which the applied treatment processes are designed to rectify. Performance data for treatment processes and systems are presented together with a review of the applicability of common analytical methods to the measurement of waste characteristics and treatment effectiveness. The techniques used to monitor waste flowages for control purposes and as means of recording treatment efficiency are included. Finally, the remaining problems relative to control and treatment of spent process waters are pointed out. Research and development needs directed toward solving these problems are defined.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: HDU

TITLE OF PROJECT: Mercury Recovery from Contaminated Wastewater and Sludges

GRANTEE OR CONTRACTOR:

Georgia-Pacific Corp.
P. O. Box 1236
Bellingham, Washington 98225

EPA PROJECT OFFICER:

Mr. Ralph H. Scott
PNERL, EPA
200 S. W. 35th Street
Corvallis, Oregon 97330

Project Site: Bellingham, Washington

DESCRIPTION OF PROJECT

Award Date: June 1971

Completion Date: October 1974

Project Cost: $506,800

Federal Cost: $227,620

Summary:

Operations were conducted to remove mercury from wastewater and sludge produced by a mercury cell chlor-alkali plant. Mercury content of the wastewater ranged from 300 - 18,000 ppb mercury while content of the brine sludge ranged from 150 to 1500 ppm Hg. Other sludges processed included sludges from a waterway near the plant outfall with a Hg content of 10-25 ppm. The removal methods selected were sulfide precipitation for the water treatment and high temperature roasting for the sludge treatment. The sulfide precipitation consisted of collecting the various water streams, adjusting the pH from 5-8 with spent sulfuric acid, settling the large solid particles, in a surge tank, adding sodium sulfide to a 1-3 ppm excess and adding diatomaceous earth at the rate of 0.07 gpl in an R. P. Adams pressure filter. The effluent Hg levels ranged from 10-125 ppb with an average of 50 ppb Hg for an 87%-99% removal, averaging 96.8%. - The sludge system included a collection system, thickener, rotary vacuum filter, multiple hearth furnace, and 3 stainless steel condensers. Processing rate for the sludge was 140-320 kg/hr, dry basis. Operating temperatures ranged from 540 C - 760 C, feed Hg content ranged from 290 to 440 ppm Hg (dry basis), and clinker Hg content after treatment contained 0.5-7.2 ppm Hg, for a removal rate of 98.3 to 99.8%. Waterway sediments containing 12.8 ppm were roasted at 730 C and clinker contained 0.95-1.7 ppm Hg for an 87-92% removal. Capital costs were $364,500 and operating costs were $32 per m ton of dry sludge treated.

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: HIG

TITLE OF PROJECT: Treatment of Wood Preserving Wastewater by Chemical and Biological Methods

GRANTEE OR CONTRACTOR:

Koppers Company, Inc.
P. O. Box 270
Carbondale, Illinois 62901

EPA PROJECT OFFICER:

Mr. James Phillips
Region V, EPA
1 North Wacker Drive
Chicago, Illinois 60606

Project Site: Carbondale, Illinois

DESCRIPTION OF PROJECT

Award Date: June 1971

Project Cost: $179,000

Completion Date:

Federal Cost: $99,500

Summary:

The project consists of the design, construction, and operation of treatment facilities for wood preserving wastewaters. The 25,000-gpd waste flow is characterized by high BOD and COD, moderate concentrations of phenols, and low pH. The proposed treatment system will utilize preskimming and sedimentation, pre- and post-chlorination, and activated sludge secondary treatment. The treatment system will be operated for a 12-month period in which performance and cost of treatment will be documented.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: HPK

TITLE OF PROJECT: Organic Compounds in Pulp Mill Lagoon Discharge

GRANTEE OR CONTRACTOR:

University of Washington
Seattle, Washington 98105

EPA PROJECT OFFICER:

Dr. Larry Keith
SERL, EPA
College Station Road
Athens, Georgia 30601

Project Site: Seattle, Washington 98105

DESCRIPTION OF PROJECT

Award Date: September 1971

Project Cost: $35,302

Completion Date:

Federal Cost: $31,772

Summary:

This project will qualitatively identify and quantitatively measure the organic compounds entering and leaving Kraft pulp mill aerated lagoons. Wastewater samples will be collected from both Kraft bleached and unbleached processes and analyzed by a gas chromatographmass spectrometer, thin layer chromatography, carbon adsorption, IR, UV, NMR, and total organic carbon analysis. The effect of wood species and biological treatment on chemical compounds will be studied to determine which compounds are destroyed and which are either produced or unchanged in the treatment process. The origin of unchanged components in the process will be determined with the aim of defining possible control points within the process.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 14-12-162

TITLE OF PROJECT: Plasma Arc Processing of Spent Sulfite Liquors

GRANTEE OR CONTRACTOR:

Electro-Optical Systems, Inc.
300 North Halstead Street
Pasadena, California 91107

Project Site: Pasadena, California

EPA PROJECT OFFICER:

Mr. George Webster
Industrial Pollution Control
Division (RD-679), EPA
Washington, D. C. 20460

DESCRIPTION OF PROJECT

Award Date: May 1968

Completion Date: February 1969

Project Cost: $49,945

Federal Cost: $49,945

Summary:

The basic objective of this project is to determine the technical and economic feasibility of plasma arc treatment of sulfite waste liquors.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 800261

TITLE OF PROJECT: Color Removal from Kraft Mill Effluents by Ultrafiltration

GRANTEE OR CONTRACTOR:

Champion International Corp.
Knightsbridge
Hamilton, Ohio 45020

EPA PROJECT OFFICER:

Mr. Edward P. Lomasney
Region IV, EPA
1421 Peachtree Street N.E.
Atlanta, Georgia 30309

Project Site: Canton, North Carolina

DESCRIPTION OF PROJECT

Award Date: February 1972

Project Cost: $152,155

Completion Date: May 1973

Federal Cost: $99,096

Summary:

The purpose of this program was to examine ultrafiltration as a means of reducing color in kraft mill effluents more efficiently and/or more economically than the presently available method. The scope of the program included the six month operation of a 10,000 gpd pilot plant at the Champion Papers' Canton, North Carolina, pulp and paper mill.

The major experimental effort dealt with treatment of pine bleaching caustic extraction filtrate with lesser emphasis on unbleached pine and hardwood pulp washing Decker effluents. Four experimental aspects of the process were evaluated: feed pretreatment, ultrafiltration, concentrate disposal and water reuse potential.

The process color removal efficiency was satisfactory. For all influent studied typical results were 90% color removal with 98.5%-99% water recovery.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 800520

TITLE OF PROJECT: Closed Process Water-Loop in NSSC Pulp Production

GRANTEE OR CONTRACTOR:

Green Bay Packaging Inc.
P. O. Box 1107
Green Bay, Wisconsin 54305

EPA PROJECT OFFICER:

Mr. Ralph H. Scott
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Green Bay, Wisconsin

DESCRIPTION OF PROJECT

Award Date: March 1972

Project Cost: $626,820

Completion Date: December 1974

Federal Cost: $300,430

Summary:

The primary objective of this project is to achieve the maximum closure of the process water-loop in an integrated neutral sulfide semichemical (NSSC) pulp and paperboard mill. Contaminated process water will be recycled for direct reuse. Excess surge volumes occurring during process upsets will be processed in a reverse osmosis plant to separate dissolved constituents from the process water. This permeate will be recycled and the separated solids will be destroyed in the fluid bed combustion system. Another objective of the project is to demonstrate the techniques required to stabilize operations and control ambient conditions in a tightly closed NSSC system.

The result of this project will be the first detailed description of activities required to accomplish a closed process water-loop in a NSSC pulp and paperboard mill.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 800740

TITLE OF PROJECT: Minimizing the Pollutional Impact of Kraft Pulping Through Oxygen Bleaching

GRANTEE OR CONTRACTOR:

The Chesapeake Corporation
of Virginia
West Point, Virginia 23181

EPA PROJECT OFFICER:

Dr. James D. Gallup
Paper & Food Products
Industries Section, EPA
Washington, D. C. 20460

Project Site: West Point, Virginia

DESCRIPTION OF PROJECT

Award Date: March 1972

Completion Date: February 1975

Project Cost: $12,160,000

Federal Cost: $438,938

Summary:

This project will demonstrate the practicality of operating a 300 ton per day three or four stage oxygen bleaching system for producing hardwood kraft pulp. The application of molecular oxygen to other unit processes including oxygen oxidation of black liquor will be investigated throughout the mill. In addition to being the first demonstration of oxygen bleaching in North America, the project will also be the first application of oxygen technology to be integrated into an entire mill system. The overall result of the project will be a bleached Kraft effluent with significant reductions in organics, both BOD and color, and inorganics, particularly chlorides.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 800853

TITLE OF PROJECT: Color Characterization Before and After Lime Treatment

GRANTEE OR CONTRACTOR:

The Institute of Paper Chemistry
P. O. Box 1048
Appleton, Wisconsin 54911

EPA PROJECT OFFICER:

Mr. Ralph H. Scott
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Appleton, Wisconsin

DESCRIPTION OF PROJECT

Award Date: January 1972

Project Cost: $142,177

Completion Date: April 1974

Federal Cost: $99,524

Summary:

In general, the lime treatment removed maximum color from the caustic extract and minimum from the neutral sulfite semichemical (NSSC) effluent. - The massive lime treatment was found to remove 73% color and 53% total organic carbon (TOC) from kraft decker effluent, and 96% color and 80% TOC from kraft bleach caustic extract. The analysis of the solids from the decker and caustic effluents showed respective reductions of 73% and 59% phenolic hydroxyls, 63% and 26% sugars, and 51% and 16% methoxyls by lime treatment. - The stoichiometric lime treatment was found to remove 79% color and 50% TOC from kraft decker effluent, and 64% color and 30% TOC from NSSC effluent. The analysis of the solids from the decker and NSSC effluents showed respective reductions of 76% and 25% phenolic hydroxyls, 31% and "negligible" percent sugars, and 42% and 9.7% methoxyls by lime treatment. - In the metal ion-lime system the addition of 150-300 ppm $FeCl_3$ with only 300-500 ppm lime removed about 98% color from bleach caustic extract. Over 50% of the color left by conventional lime treatment process could also be removed by incorporating polyvalent metal ions with lime. However, below 1000 ppm of lime, the sludge obtained settled slowly. More color could be removed by metal ion-lime system than when each was used individually indicating that a "synergistic" effect exists.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 801202

TITLE OF PROJECT: Pyrolysis of Industrial Waste for Oil and Activated Carbon Recovery

GRANTEE OR CONTRACTOR:

Garrett Research and
Development Co., Inc.
1855 Carrion Road
LaVerne, California 91750

EPA PROJECT OFFICER:

Dr. Kirk Willard
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: LaVerne, California

DESCRIPTION OF PROJECT

Award Date: May 1972

Project Cost: $440,746

Completion Date:

Federal Cost: $292,556

Summary:

The objective of this research project is to demonstrate the economic and technical effectiveness of the flash pyrolysis process to dispose of industrial wastes, principally bark, with the production of activated carbon and heating oil as by-products. A modified four ton/day pilot plant will be operated utilizing bark, rice hulls, and cattle feedlot wastes to provide process engineering data for the design of commercial scale demonstration plants.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 801206

TITLE OF PROJECT: Water Reuse in a Paper Reprocessing Plant

GRANTEE OR CONTRACTOR:
Big Chief Roofing Company
P. O. Box 908
Ardmore, Oklahoma 73401

EPA PROJECT OFFICER:
Mr. John Ruppersberger
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Admore, Oklahoma

DESCRIPTION OF PROJECT

Award Date: June 1972

Project Cost: $120,709

Completion Date: February 1975

Federal Cost: $45,063

Summary:

This project is concerned with the treatment of paper reprocessing waste water in a facility designed for water reuse. Economic reasibility of waste water recycle and various treatment alternatives are determined from laboratory and full-scale tests. Studies will determine the effect of recycle on product quality; predict increases in operating costs resulting from increased corrosion rates, scale formation, slime growths and deposits; determine savings from decreased waste treatment costs; fiber losses, and water use; and determine increases in chemical costs for slime control and corrosion inhibition.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 801876

TITLE OF PROJECT: A Test Method for Volatile Component Stripping of Waste Water

GRANTEE OR CONTRACTOR:

College of Engineering
University of Arkansas
Fayetteville, Arkansas 72701

EPA PROJECT OFFICER:

Mr. John S. Ruppersberger
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Fayetteville, Arkansas

DESCRIPTION OF PROJECT

Award Date: October 1972

Project Cost: $33,954

Completion Date: May 1974

Federal Cost: $24,705

Summary:

This work is concerned with the air-strippable volatile organic fraction of industrial wastewaters. The primary purpose was to develop laboratory apparatus and procedures that may be employed to assess the desirability of air-stripping in cooling towers as a treatment operation for removal of a portion of the organics from industrial wastewater. The apparatus developed consists of a short packed (Intalox Saddle) section with liquid recirculation and single pass countercurrent air flow. Desorption is performed in the apparatus at 25°C and ambient pressure conditions.

Desorption experiments were performed on single pure components in water, simulated wastewater preparations and actual industrial wastewater samples. Industrial wastewater samples were representative of: poultry, metal, oil-field, canning, pharmaceutical, paper, food, fibers, petroleum refinery and petrochemical industries. BOD, COD, TOC, and gas chromatographic analysis were employed with the experiments.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 801207

TITLE OF PROJECT: Treatment of Sulphite Evaporator Condensates for Recovery of Volatile Compounds

GRANTEE OR CONTRACTOR:

The Institute of Paper Chemistry
P. O. Box 1048
Appleton, Wisconsin 54911

EPA PROJECT OFFICER:

Mr. Ralph H. Scott
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Appleton, Wisconsin

DESCRIPTION OF PROJECT

Award Date: May 1972

Completion Date: December 1973

Project Cost: $150,000

Federal Cost: $40,000

Summary:

Pilot studies were conducted on two routes for recovery of volatile components in condensates from evaporation of spent liquors from acid sulfite pulping. The condensates were steam stripped prior to adsorption on activated carbon. The first route utilized fractional distillation and solvent extraction from the carbon, while the second route used low-temperature thermal regeneration. Relatively pure SO_2, methanol, furfural, and ethyl acetate were recovered. Estimated process economy, based upon recovery of saleable volatiles, favorable mass and heat balances, and credits for BOD removal, indicates the first route may provide a favorable method for the removal of pollutants from condensates. Low temperature regeneration studies failed due to mechanical design problems, but this second route continues to be considered as technically feasible. This report concludes that steam stripping of condensates from a sulfite pulping process will yield reusable and saleable material of value exceeding the cost of steam stripping associated with attaining a reduction in BOD_5 up to 90% in the condensate.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 803119

TITLE OF PROJECT: Mechanisms for Removal of Soluble BOD_5 in Clarification Systems

GRANTEE OR CONTRACTOR:

The Institute of Paper Chemistry
Appleton, Wisconsin

EPA PROJECT OFFICER:

Mr. Ralph H. Scott
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Appleton, Wisconsin

DESCRIPTION OF PROJECT

Award Date: July 1974

Completion Date: July 1975

Project Cost: $161,130

Federal Cost: $50,000

Summary:

The objective is to develop and apply a greater understanding of the mechanisms for removal of soluble BOD in clarifiers, to new and more practical in-plant treatment of process water for increased recycle, and to improve existing clarification systems efficiencies.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 803270

TITLE OF PROJECT: Activated Carbon Treatment of Kraft Pulp Bleaching Effluents

GRANTEE OR CONTRACTOR:

St. Regis Paper Company
Cantonement, Florida

EPA PROJECT OFFICER:

Mr. John S. Ruppersberger
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Cantonement, Florida

DESCRIPTION OF PROJECT

Award Date: July 1974

Completion Date: April 1975

Project Cost: $106,990

Federal Cost: $69,594

Summary:

The principle objective is to demonstrate activated carbon treatment of highly colored chlorination and caustic extraction stage effluents. This project will use the pilot plant from a related study, EJU, in which kraft pulp mill effluents were treated for general reuse in the mill. However, chlorides remaining in the activated carbon treated bleach plant effluents prevent general reuse. In this project activated carbon treatment of bleach plant wastewater will be principally for color removal prior to discharge, or for general mill reuse after chlorides are removed by another process.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 803302

TITLE OF PROJECT: Treatment of Sulfite Evaporator Condensate for Recovery of Volatile Components

GRANTEE OR CONTRACTOR:

Flambeau Paper Co.
Park Falls, Wisconsin

EPA PROJECT OFFICER:

Mr. Ralph H. Scott
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Park Falls, Wisconsin

DESCRIPTION OF PROJECT

Award Date: July 1974

Completion Date: November 1976

Project Cost: $3,407,521

Federal Cost: $500,000

Summary:

This project involves the operation of a mill scale plant to demonstrate the treatment of evaporator condensate. The aim is to show that soluble products and separate clean water, for reuse in the sulfite washing system, can be produced.

The system proposes to recover methanol, furfural and ethyl acetate of industrial purity, as well as the recovery of sulfur dioxide for use in the making of cooking acid.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 803347

TITLE OF PROJECT: Heat Treatment for Paper Mill Sludge Conditioning

GRANTEE OR CONTRACTOR:

National Council of the Paper
Industry for Air and Stream
Improvement
260 Madison Avenue
New York, New York 10016

EPA PROJECT OFFICER:

Mr. Victor J. Dallons
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Western Michigan Univ., Kalamazoo, Michigan

DESCRIPTION OF PROJECT

Award Date: July 1974

Completion Date: July 1975

Project Cost: $59,095

Federal Cost: $29,546

Summary:

Various sludges from paper mills will be heat treated to assist in dewatering. Wet oxidation will be employed for deinking waste sludge to determine if it will enable the reuse of the paper fillers on new products. The papers produced will be tested for marketable characteristics. Acid hydrolysis will also be investigated for its beneficial aid in heat treatments.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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ENVIRONMENTAL PROTECTION AGENCY
RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet briefly describes an R & D project Section 104 or 105 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

PROJECT NUMBER: 803348

TITLE OF PROJECT: Investigation of Reuse Potential of Ash from Paper Mill Sludges

GRANTEE OR CONTRACTOR:

National Council of the Paper Industry
for Air and Stream Improvements, Inc.
260 Madison Avenue
New York, New York 10016

EPA PROJECT OFFICER:

Mr. Victor J. Dallons
PNERL, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Western Mich. Univ., Kalamazoo, Michigan

DESCRIPTION OF PROJECT

Award Date: July 1974

Project Cost: $47,120

Completion Date: July 1975

Federal Cost: $23,545

Summary:

The sludge produced from primary treatment of white water from paper making where inert filler and coatings are used, will be separated by vibratory screens and the ash content used back on paper making. Tests will determine the feasibility of this reuse process and the new paper quality.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

FINAL PROJECT REPORTS

PULP, PAPER, PAPERBOARD, LUMBER AND WOOD PRODUCTS INDUSTRIES

REPORT NUMBER	TITLE/AUTHOR	SOURCE
12040 EUG 10/69	Foam Separation of Kraft Pulping Wastes, Georgia Kraft Company, Rome, Georgia	NTIS PB 189 160
12040 EZZ 04/70	Dilute Spent Kraft Liquor Filtration Through Wood Chips, School of Forest Resources, University of North Carolina, Raleigh, North Carolina.	NTIS PB 191 873
12040 EBY 08/70	Aerial Photographic Tracing of Pulp Mill Effluent in Marine Waters, Oregon State University, Corvallis, Oregon.	GPO $1.25
12040 ELW 12/70	Aerated Lagoon Treatment of Sulfite Pulping Effluents, The Crown Zellerbach Corporation, Lebanon, Oregon.	GPO $1.25
12040 EMY 12/70	Multi-System Biological Treatment of Bleached Kraft Effluents, The Mead Corporation, Chillicothe, Ohio.	GPO $2.00
12040 EFC 01/71	Pollution Abatement by Fiber-Modification, College of Forest Resources, Inst. of Forest Products, University of Washington, Seattle, Washington.	GPO $0.65
12040 EEK 08/71	Treatment of Selected Internal Kraft Mill Wastes in a Cooling Tower, Georgia Kraft Company, Rome, Georgia.	GPO $1.25
12040 DLQ 08/71	Slime Growth Evaluation of Treated Pulp Mill Waste, Dept. of Microbiology, Oregon State University, Corvallis, Oregon.	GPO $1.50
12040 FUB 01/72	Recycle of Papermill Waste Waters and Application of Reverse Osmosis, by D. C. Morris, W. R. Nelson, and G. O. Walraven, Green Bay Packaging Inc., Green Bay, Wisconsin.	GPO $1.00
12040 FES 07/71	Sludge Material Recovery System for Manufacturers of Pigmented Papers, by S. D. Warren Co., A Div. of Scott Paper Company, Environmental Improvement Dept., Westbrook, Maine.	GPO $1.00

REPORT NUMBER	TITLE/AUTHOR	SOURCE
EPA 660/2-73-019	Color Removal From Kraft Mill Effluents by Ultrafiltration, by H. A. Fremont, D. C. Tate, and R. L. Goldsmith, Champion International Corp., Hamilton, Ohio.	GPO $2.40
EPA 660/2-74-029	Color Characterization Before and After Lime Treatment by H. S. Dugal, R. M. Leekley, and J. W. Swanson, The Institute of Paper Chemistry, Appleton, Wisconsin.	GPO $2.15
EPA 660/2-73-030	Treatment of Sulphite Evaporator Condensates for Recovery of Volatile Compounds by K. W. Boierl, N. L. Chang, B. F. Lueck, A. J. Wiley, and R. A. Holm, The Institute of Paper Chemistry, Appleton, Wisconsin.	GPO $2.10
EPA 660/2-74-044	A Test Method for Volatile Component Stripping of Waste Water, Louis J. Thibodeaux, University of Arkansas, Fayetteville, Arkansas. May 1974.	GPO $1.70
12040 ENC 12/71	Color Removal from Kraft Pulping Effluent by Lime Addition, by C. L. Davis Jr., Interstate Paper Corporation, Riceboro, Georgia.	GPO $1.25
12040 EEL 02/72	Reverse Osmosis Concentration of Dilute Pulp and Paper Effluents, by A. J. Wiley, G. A. Dubey, and I. K. Bansal, Pulp Manufacturing Research League and Institute of Paper Chemistry, Appleton, Wisconsin	GPO $2.75
EPA-R2-73-255	Ion Exchange Color and Mineral Removal from Kraft Bleach Wastes, Robert L. Sanks, Montana State University, Bozeman, Montana	GPO $2.35
EPA-R2-73-195	Aerobic Secondary Treatment of Plywood Glue Wastes, J. L. Graham, CH2M/HILL, Corvallis, Oregon, and Columbia Plywood Corporation, Portland, Oregon	GPO $0.90
EPA-R2-73-164	Kraft Pulping Effluent Treatment and Refuse State-of-the-Art, by W. G. Timpe, E. Lang, and R. L. Miller, St. Regis Paper Company R&D Center, Pensacola, Florida	GPO $1.25
EPA-R2-73-196	Steam Stripping Odorous Substances from Kraft Effluent Streams (SEKOR), Dept. of Chemical Engineering, University of Washington, Seattle, Washington, by B. F. Hrutfiord, L. J. Johanson and J. L. McCarthy	GPO $1.25

REPORT NUMBER	TITLE/AUTHOR	SOURCE
EPA-R2-73-232	Methods for Pulp and Paper Mill Sludge Utilization and Disposal, by T. A. Aspitante, A. S. Rosenfield, B. C. Smale, and H. R. Amberg of Environmental Services Division, Crown-Zellerbach Corp., Camas, Washington.	GPO $2.10
EPA-R2-73-086	Color Removal from Kraft Pulp Mill Effluents by Massive Lime Treatment by J. L. Oswalt and J. G. Land, Jr., International Paper Company, Springhill, La.	GPO $2.00
EPA-R2-73-085	The Influence of Log Handling on Water Quality, by F. D. Schaumberg, Oregon State University, Corvallis, Oregon 97331.	GPO $2.00
EPA-R2-73-141	Kraft Effluent Color Characterization Before and After Stoichiometric Lime Treatment, by J. W. Swanson, H. S. Dugal, M. A. Buchanan, and E. A. Dickey.	GPO $1.00
EPA-660/2-73-028	Coliform Bacteria Growth and Control in Aerated Stabilization Basins, by S. H. Watkins, Crown-Zellerbach, Camas, Washington.	GPO $2.75
EPA-660/2-74-067	Studies of Low Molecular Weight Lignin Sulfonates, Dept. of Chemical Engineering, University of Washington, Seattle, Washington.	GPO $1.55
EPA-R2-73-184	State-of-the-Art of Pulp and Paper Waste Treatment, by Dr. Harry Gehin, WAPORA, Inc. Washington, D. C.	GPO $2.50
EPA-660/2-74-008	Color Removal and Sludge Disposal Process for Kraft Mill Effluents, by E. L. Spruill, Jr., Continental Can Company, Hodge, LA.	GPO $1.65

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